

November

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POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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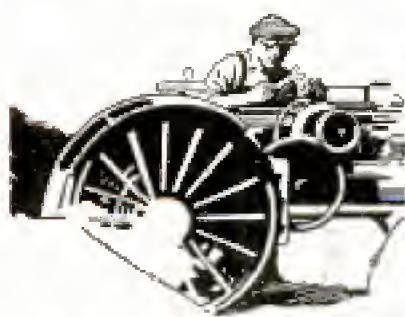


HOW FAR CAN
A LOCOMOTIVE
JUMP?
See Page 675

It takes only 8 weeks to get a big job



O. H. Justus owns a big agency and repair shop at Parkersburg, W. Va. He says "that my schools give motor secrets that will put any man 'on easy street.'"



Emanuel Rushfeldt, Alberta, says: "Earning \$10 a day and only 20 years old."



W. W. Pence gets \$250 a month and expenses operating a tractor in the oil fields.



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This actually happened in a directors' room

It helps to explain why executives are turning to the Alexander Hamilton Institute in larger numbers than ever before

In the quiet, almost luxurious, directors' room the department heads of a certain large manufacturing company were called together by the general manager.

One after another the production manager, the purchasing agent, the head of the planning department and the sales manager expressed themselves. The burden of each man's excuse was the same: "If I had received proper co-operation from the other departments we would have met our quota easily."

The general manager spoke last, a keen aggressive man of thirty-eight, who had been brought in from the outside.

"Gentlemen, you have told me far more than you imagine," he said. "It's perfectly clear what is the matter with this concern. You may have forgotten that it is a *business* and not merely a collection of departments. You are first-class specialists, crackajacks in your own departments, but

Gentlemen, you are mighty poor business men!"

They were too stunned to answer.

"I'll repeat it," the general manager said. "You—all of you—are poor business men. You're

a group of stars but you aren't a team. Each of you knows his own viewpoint; he knows his work and knows it well. But you do not know enough about each other's problems to make this company an effective business unit.

"The sales department has got to know more about production, and accepting and costs; the production department has got to think more in terms of sales and credits—each one of you has got to get some vision of business as a whole, in all its varied and inter-related departments. That's what this company needs—and it needs it badly."

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More than 24,000 executives enrolled

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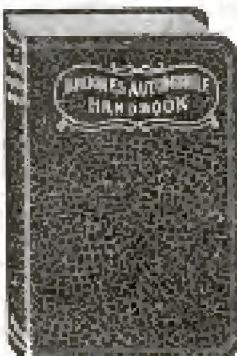
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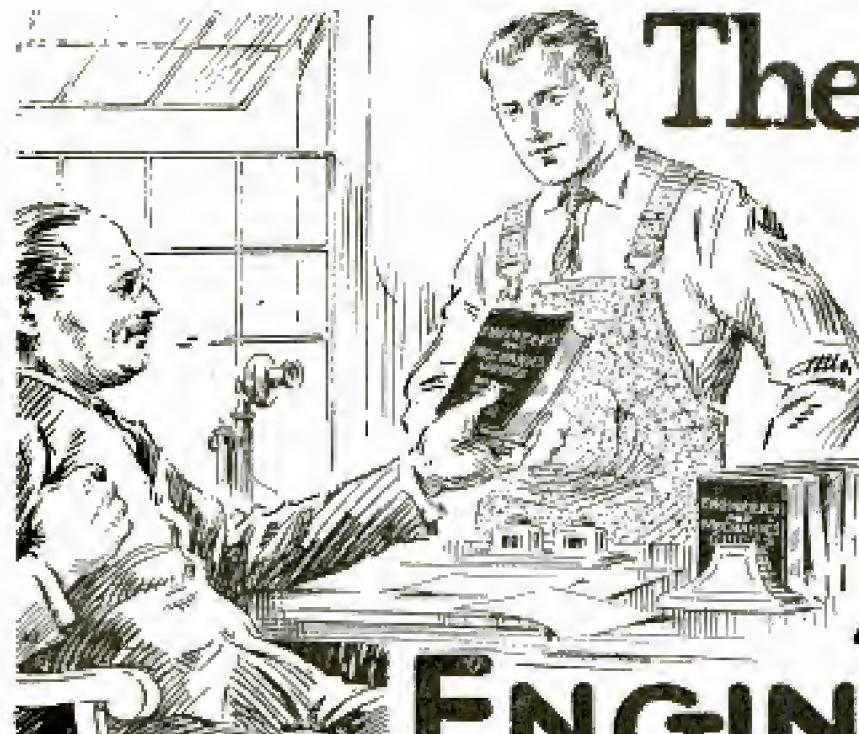
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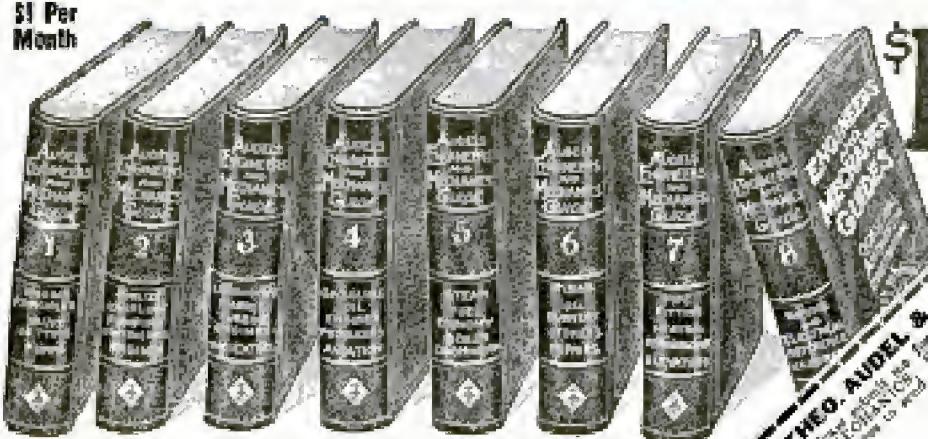
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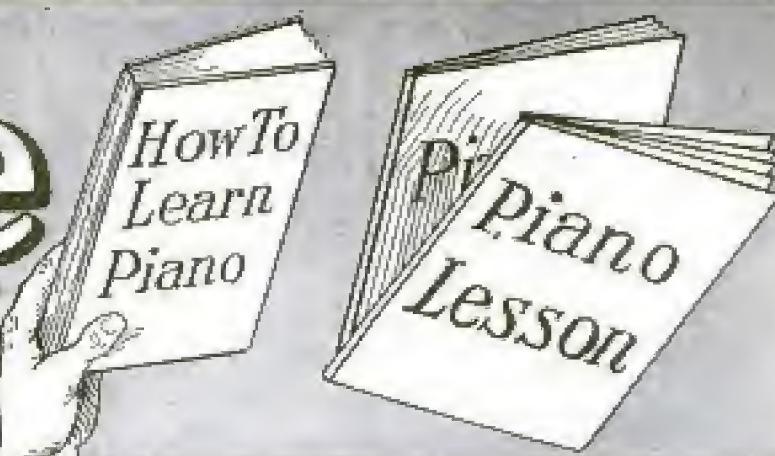
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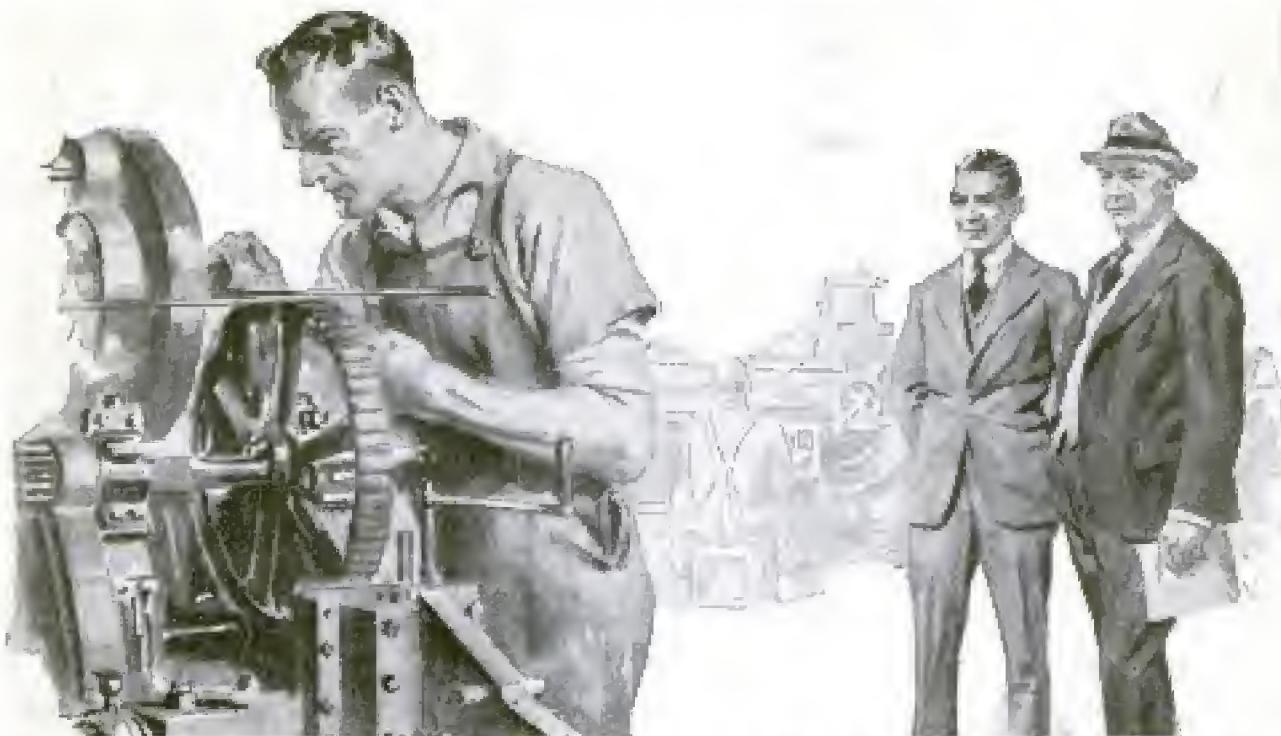
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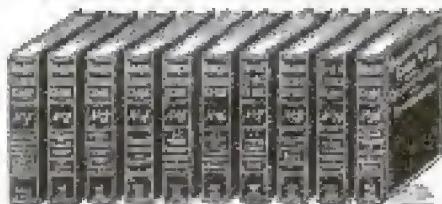
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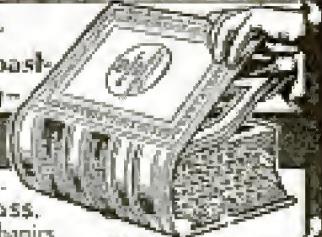
Postpaid, a sample of our style Rebelle
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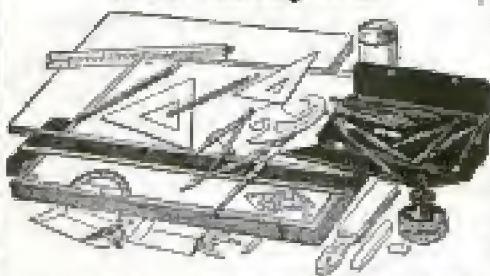
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Here is a great and highly paid profession open to you. **Learn Drafting now.** No matter where you live or what you are doing you can become a master-draftsman by spare time study at home. No previous experience necessary.

If you can read and write you can become a high-salaried expert draftsman by Chicago Tech's quick and easy method. In twenty years we have trained thousands who are now top-notchers in the drafting business.

Construction Lines are Booming—Get Ready

Drafting is the very foundation of building and construction lines. The architectural, structural steel, mechanical and electrical industries are all calling for expert draftsmen. There is a boom coming in these lines—it's here now! This is a real opportunity which every ambitious man should grasp.



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Building Experts Wanted

The Building Business is booming. Splendid opportunities are open. Big money will be made in the next five years by men in the building trades who know how to read plans, make estimates, superintend jobs, take contracts, etc.

Special Offer for Men in Building Trades

We have a special plan of great interest to Bricklayers, Carpenters, Plumbers, Plasterers, Foremen, Superintendents, Contractors and other men in building lines.

Send Coupon For Free Book and Blue Prints

Mark "X" in the second square of the coupon if you have had experience in any building trade. We will send you free and postpaid, a book of drawings and blue prints, also our big new book, "How to Read Blue Prints." Tell every builder you know to send for these books—they're free to men in the building trades.

Easy to Learn, Quick Results

By Chicago Tech's easy method you can learn Drafting quickly in your spare time right at home. Even though you cannot come and study Drafting in the day and evening classes of our big Chicago school, the same system of lessons used there with such pronounced success are sent to you. The same expert teachers guide you in your work at home.

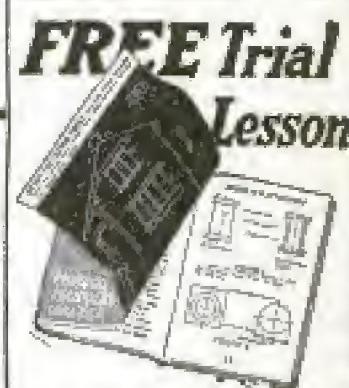
Act Now. Mail the Coupon

Big jobs are waiting. We can train you to fill them. It takes only a little of your spare time. No experience or previous education required. Put your name on the coupon and get full information; it costs you nothing.

Chicago Tech. College, 1130 Chicago Tech. Bldg., Chicago, Ill.

Without cost or obligation to me please send instructive matter about opportunities to me I have marked with "X".

- Drafting.** (The Big Salary course)
No experience necessary.
- Building Trade Courses.**
For men in the building lines.
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- Automobiles, Gas Engines, Heating, Lighting, etc.
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All about aeroplanes.
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While other schools ask you to enroll and send money first, we send the free lesson first. Read it, practice the exercises, and then decide for yourself whether to take the course or not.

Name.....

Address.....

Post Office..... State.....



"Another \$50 Raise!"

"Why, that's the third increase I've had in a year! It shows what special training will do for a man."

Every mail brings letters from some of the two million students of the International Correspondence Schools, telling of advancements won through spare-time study.

How much longer are you going to wait before taking the step that is bound to bring you more money? Isn't it better to start now than to wait for years and then realize what the delay has cost you?

One hour after supper each night spent with the I. C. S. in your own home will prepare you for the position you want in the work you like best.

Without cost, without obligation, mark and mail this coupon. Do it right now!

— TEAR OUT HERE —
INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 5679-C, Scranton, Penna.

Without cost or obligation, please tell me how I can qualify for the position or in the subject before which I have marked an X:

BUSINESS TRAINING DEPARTMENT

- Business Management
- Industrial Management
- Personnel Organization
- Traffic Management
- Business Law
- Banking and Banking Law
- Accountancy (including C.P.A.)
- Nicholson Cost Accounting
- Bookkeeping
- Private Secretary
- Business Spanish
- French
- Substitution
- Advertising
- Better Letters
- Foreign Trade
- Stenography and Typing
- Business English
- Civil Service
- Railroad Mail Clerk
- Common School Subjects
- High School Subjects
- Illustrating
- Cartooning

TECHNICAL AND INDUSTRIAL DEPARTMENT

- Electrical Engineers
- Electric Lighting
- Mechanical Engineer
- Mechanical Draftsman
- Machine Shop Practice
- Industrial Positions
- Gas Engine Operators
- Civil Engineer
- Surveying and Mapping
- Metallurgy
- Steam Engineering
- Radio
- Automobile Engines
- Architect
- Book Print Headline
- Contractor and Builder
- Architectural Draftsman
- Concrete Builder
- Structural Engineer
- Plumbing and Heating
- Chemistry
- Pharmacy
- Automobile Work
- Navigation
- Agriculture and Poultry
- Mathematics

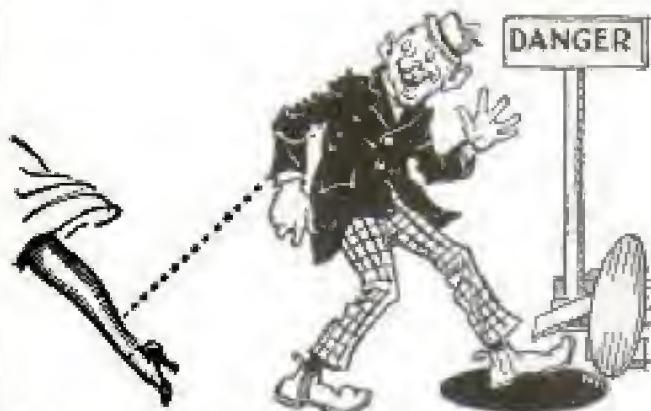
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City State

Occupation

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Please mention Popular Mechanics



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Write today for our handsomely illustrated Free Booklet, which tells you how at the cost of but a few cents a day you can learn to draw pictures that bring you from \$50 to over \$500. Read about the big demand for Artists by Newspapers, Magazines, Department Stores, Advertising Agencies and Business Concerns—about the amazing success of our students. Special short time offer of Complete Artist's Outfit Free to new students. Write for Free Booklet and details of this offer. Mail card today. Address

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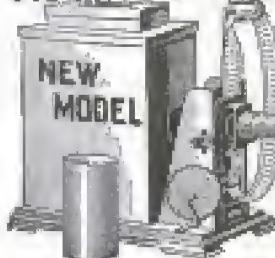
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Let Me Show You How FREE

To the average man the \$10,000-a-year job is only a dream. Yet today there are a surprising number of men earning five figure salaries who were merely dreaming of them a short while ago. The secret of their success should prove a startling revelation to every ambitious man who has ever aspired to get into the \$10,000-a-year class.

"There is nothing "different" about the man whose salary runs into five figures. He is made of the same stuff as you and I. For example, take J. P. Overstreet, of Dallas, Texas. A few short years ago he was a police officer earning less than \$1,000 a year. Today his earnings are in excess of \$1,000 a month—more than \$12,000 a year. C. W. Campbell, Greensburg, Pa., was formerly a railroad employee on a small salary—last month his earnings were \$1,562.

Why Don't YOU Get into the Selling Field?

Read These Amazing Stories of Success

Earned \$524 in Two Weeks

I had never sold more than \$2 a month. Last week I earned \$524 and this week \$312. I have done enough for me. —G. W. Keeler, Indianapolis, Ind.

I Now Earn as High as \$100 a Day

I long yearned for a big position. Now here I am with plenty. And my money is the largest sum I ever had. —P. H. I have earned over \$100 a day. —C. W. Campbell, Greensburg, Pa.

Earned \$1562 in Thirty Days

My earnings for the past two days are \$1,000 and \$1,500, and I am second in rank. —J. P. Overstreet, Early reward. —C. W. Campbell, Greensburg, Pa.

Earned \$1,000 in Six Weeks

My earnings last month were over \$1,000 and over \$1,500 for the last two weeks, while last week my earnings were \$1,500. I have eleven months out of the year working 6 days each week.

The N. S. T. A. does the rest of the job where I was earning less than \$1,000 a year and showed me how to make it minutes.—J. P. Overstreet, Dallas, Texas.

Mr. Overstreet, Mr. Campbell, and the others whose letters you see on this page are all successful salesmen. They have stepped into the \$10,000-a-year class—and they never sold goods before! It is hard to believe that such big success could come so quickly and easily. Yet it was all amazingly simple! Ask them the secret of their sudden success. They will tell you they owe it to the National Salesmen's Training Association. This is an organization of top-notch salesmen and sales managers formed expressly for the purpose of training men to sell and helping them to good selling positions. It has taken hundreds of men from all walks of life and

made them Master Salesmen—it has lifted them out of the rut and shown them the way to magnificent earnings, in fascinating careers and big selling positions.

We Train You and Help You Land a Job

What these men have done you can do! In your spare time at home you can easily master the secrets of selling that make Star Salesmen. Whatever your experience has been—whatever you may be doing now—whether or not you think you can sell—just answer this question: Are you ambitious to earn \$10,000 a year? Then send me your name quick! I will prove to you without cost or obligation that you can easily become a Star Salesman. I will show you how the Salesmanship Training and Free Employment Service of the N. S. T. A. will help you to wonderful success in selling.

Free Book on Salesmanship

Just mail the coupon or write for our great illustrated book, "Modern Salesmanship," which we will send you free. Let us prove to you that regardless of what you are doing now you can quickly become a Star Salesman. Let us show you how you, too, can step into the ranks of the big money makers of business. See how easily you can learn this fascinating, big pay profession at home in your spare time. Learn what we have done for others and what we stand ready to do for you. Don't put it off until tomorrow—write us today. Mail the coupon at once.

National Salesmen's Training Association
Dept. 12-S, Chicago, Ill., U. S. A.

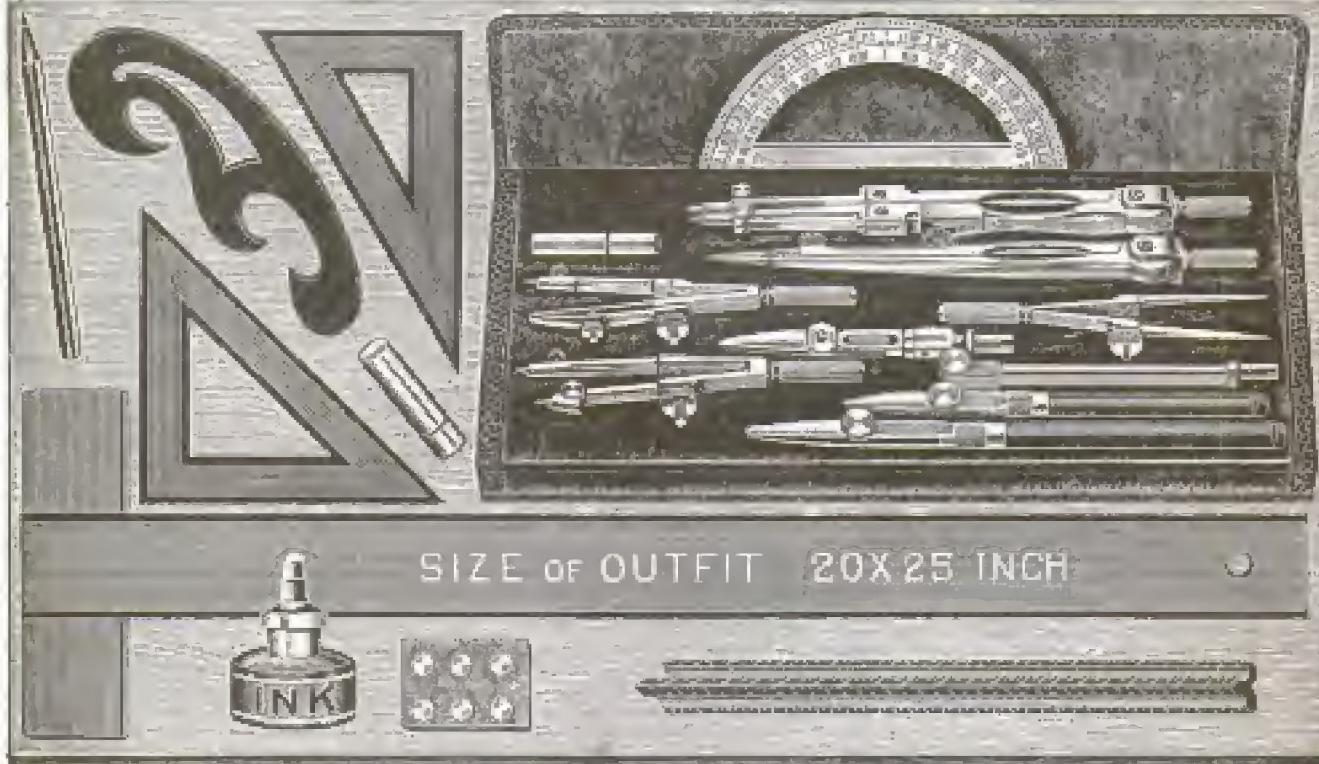
National Salesmen's Training Association
Dept. 12-S, Chicago, Ill., U. S. A.

Please send me, without any obligation on my part, your free book, "Modern Salesmanship," and full information about the N. S. T. A. system of Salesmanship Training and Employment Service. Also a list showing lines of business with openings for salesmen.

Name.....
Street.....
City..... State.....
Age..... Occupation.....

\$80 Drafting

To every student enrolling now I give an opportunity of getting an \$80 drafting course absolutely without cost to him. So send in your sketch today and learn all about this offer.



Drawing Outfit Free!

To every student enrolling now I give an opportunity also of getting a regulation draftsman's outfit made up of the very same instruments which I use myself. Every student gets this splendid set without cost. See illustration above.



Draftsman's Pocket Rule FREE! —To Everyone Sending the Sketch

To every man sending copy of sketch shown on next page I am going to mail free and prepaid the Draftsman's Ivarine Pocket Rule shown here. This will come to you entirely with my compliments. With it I will send a 6x9 book on "Successful Draftsmanship." If you

are interested in becoming a draftsman, if you think you have or may attain drafting ability, sit down and copy the drawing on next page, mailing it to me today, writing your name and your address and your age plainly on the sheet of paper containing the drawing.

Read Next Page for Full Particulars

Course FREE

Copy This Sketch

I AM anxious to find men with desire to become draftsmen. With business picking up everywhere many thousands of draftsmen will be needed at salaries ranging from \$3000 to \$3600 per year.

In asking you to copy this sketch I believe I will be able to tell from the sketch you send in what kind of an opportunity you will have in this great profession.

There are no conditions requiring you to buy anything. You are under no obligations in sending your sketch. What I want to know is how much you are interested in drawing and your sketch will tell me that.

Ambitious boys and men between the ages of 16 to 50 are wanted by big business concerns, and the man who is ready when opportunity calls him will get the best position and the highest pay.

Mail Your Drawing At Once —and Get an Ivorine Pocket Rule Absolutely FREE!

Ambitious men interested in drafting, hurry! Don't wait. This is your opportunity to get into this great profession. Accept the offer which I am making now. Send in your sketch or request for FREE book and FREE Ivorine Pocket Rule. Mail the coupon TODAY!



Copy this sketch

\$250 to \$300 per Month

I am Chief Draftsman of the Engineers' Equipment Co., and I know that there are thousands of ambitious men who would like to better themselves, make more money and secure faster advancement. Positions paying \$250 to \$300 per month, which ought to be filled by skilled draftsmen, are vacant everywhere. I want to find the men who with practical training and personal assistance will be qualified to fill these positions. No man can hope to share in the great coming prosperity in manufacturing and building unless he is properly trained and is able to do first class practical work.

I know that this is the time to get ready. This is why I am making the above offer. I can now take and train a limited number of students personally and I will give to those students a guarantee to give them by small practical drawing room training until they are placed in a permanent position with a salary of \$250 to \$300 per month.

Send Coupon for Free Book

Send coupon for my free book, "Successful Draftsmanship". Also full information as to how you can get an \$80 Draftsman's Course Free. Even if you don't send in a sketch send the coupon for the free book.

Chief Draftsman, Engineers' Equipment Co.
4001 Broadway, Div. 1358, Chicago, Ill.

You should act promptly on this offer because it is my belief that even though you start now the great boom will be well on by the time you are ready to accept a position as a skilled draftsman. So write to me at once. Enclose sketch or not, as you choose, but find out about the opportunities ahead of you. Let me send you the book "Successful Draftsmanship" telling how you may take advantage of these opportunities by learning drafting at home.

I Guarantee

to train you until you are placed in a position paying \$250 to \$300 per month.

Chief Draftsman, Engineers' Equipment Co.
4001 Broadway, Div. 1358, Chicago, Ill.

Without any obligation to me please mail your book "Successful Draftsmanship" and full particulars of your liberal "Personal Direction" offer to a few students. Also full information as to how I can get an \$80 Drafting Course Free.

Name

Address

Age



"I'm Going to Make More Money!"

"I'm tired working for a small salary. I know I have just as good a head on me as Fred Moore and Bob Roberts, for we used to work side by side. But they've gone far ahead of me.

"Why? Because they saw the value of special training, and I didn't.

"But I know better now. If the International Correspondence Schools can raise the salaries of men like Fred Moore and Bob Roberts, they can raise mine, too!

"If they have helped others to advance, they can help me. Today—right now—I'm going to send in this coupon and at least find out what the I. C. S. can do for me."

— TEAR OUT HERE — INTERNATIONAL CORRESPONDENCE SCHOOLS Box 5680-C, Berwyn, Penna.

Without cost or obligation, please tell me how I can qualify for the position or in the subject lines which I have marked an X.

BUSINESS TRAINING DEPARTMENT

- | | |
|---|---|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Salesmanship |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Advertising |
| <input type="checkbox"/> Personnel Organization | <input type="checkbox"/> Better Letters |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Foreign Trade |
| <input type="checkbox"/> Business Law | <input type="checkbox"/> Stenography and Typing |
| <input type="checkbox"/> Banking and Stocking Law | <input type="checkbox"/> Business English |
| <input type="checkbox"/> Accountancy (including C.P.A.) | <input type="checkbox"/> Civil Service |
| <input type="checkbox"/> Nicholson Cost Accounting | <input type="checkbox"/> Railway Mail Clerk |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Common School Subjects |
| <input type="checkbox"/> Private Secretary | <input type="checkbox"/> High School Subjects |
| <input type="checkbox"/> Business Spanish | <input type="checkbox"/> Illustrating |
| <input type="checkbox"/> French | <input type="checkbox"/> Accounting |

TECHNICAL AND INDUSTRIAL DEPARTMENT

- | | |
|--|--|
| <input type="checkbox"/> Electrical Engineers | <input type="checkbox"/> Architect |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Blue Print Reading |
| <input type="checkbox"/> Mechanical Engineers | <input type="checkbox"/> Contractor and Builder |
| <input type="checkbox"/> Mechanical Draftsmen | <input type="checkbox"/> Architectural Draftsmen |
| <input type="checkbox"/> Machine Shop Practice | <input type="checkbox"/> Concrete Builder |
| <input type="checkbox"/> Railroad Positions | <input type="checkbox"/> Structural Engineer |
| <input type="checkbox"/> Gas Engine Operators | <input type="checkbox"/> Plumbing and Heating |
| <input type="checkbox"/> Civil Engineer | <input type="checkbox"/> Chemistry |
| <input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Metallurgy | <input type="checkbox"/> Automobile Work |
| <input type="checkbox"/> Steam Engineering | <input type="checkbox"/> Navigation |
| <input type="checkbox"/> Radio | <input type="checkbox"/> Agriculture and Poultry |
| | <input type="checkbox"/> Mathematics |

Name _____ Street _____ No. _____ Date _____

City _____ State _____

Occupation _____

Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Located, Montreal, Canada.

Please Mention Popular Mechanics



MORE THAN \$100 a Day!

CLARE BRIGGS, the man who draws "When a Fellow Needs a Friend," receives more than \$100 a day. There are many other cartoonists making incomes that would look good to a bank president.

If you have ideas and like to draw, you may have in you the making of a great cartoonist.

Federal training gives you the opportunity to develop your ability under the guidance of 60 of America's leading artists and illustrators. What this school will do for you by mail in your spare time is told in the 32 page book, "A Road to Bigger Things." It contains studio pictures of Briggs, McCutcheon, Sid Smith, Fortune Fox, and many other stars on the Federal staff. Write for your FREE COPY to-day. Just tear out this advertisement. Write your name, address and age in the margin and mail it now.

Federal Schools, Inc.

1103 Federal Schools Bldg. Minneapolis, Minn.

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Select from the 44 styles, colors and sizes of
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Write today for free
Rider Catalog. Free
factory prices and instructions
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If you stammer attempt an stammering school, tell you right my large FEDERAL book entitled "STAMMERING, its Cures and the Advanced Natural Method of Cure," bound in cloth and stamped in pure gold. Ask for special tuition rate and a FREE copy of "The Natural Speech Magazine," largest, best equipped and most successful school in the world for the cure of stammering, stuttering, etc. No sing-song or time beat. Write today. The North-Western School, 2317 Grand Ave., Milwaukee, Wis.

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Wonderful opportunities constantly offered trained men; we train you thoroughly to start your own business or make good money as motor expert, driver, shop foreman, etc.

7,000 Graduates making good. Catalog Free

Cleveland Automobile School, 1814 E. 24th St., Cleveland, O.

Be An Auto Expert



I WILL MAKE YOU ONE!—by my complete, practical, simple, easy, auto, truck and tractor course—which you can master in your home—at your leisure—without giving up your present job. I will make you a "Cooke Trained Expert." With that title you can command **respect—and big money.**

When you work with me, you don't just "learn" things. **YOU DO THINGS!** YOU BEGIN TO ACHIEVE RIGHT FROM THE START.

Choose Your Career NOW!

Think of it! Eleven million motor driven vehicles in this country today—and any one of them is liable any minute to need attention. The automobile field is a "gold field." STAKE YOUR CLAIM NOW AND AVOID THE RUSH. Choose the right career—show some "pop" and enthusiasm—and **you can be your own boss.** Any one of the following careers is open to you. TAKE YOUR CHOICE:

Owner or Manager of a Garage; Demonstrator and Salesman; Tractor Engineer; Auto Mechanic; Auto Electrician; Battery Expert; Welder; Tire Vulcanizer; Truck Driver; Chauffeur.

\$150 in 3 Days!

Men who have worked with me are now earning big incomes. You just ought to read the heart warming letters I receive from grateful students who feel that they owe their success in life to me. One tells of making \$150 in three days. Another says, "The man I used to assist is now **my helper!**" And that's just the point! One man under my guidance, **goes ahead**, while the self-satisfied fellow

stands still—or goes backward! Enroll with me and go ahead! I promise to **push** you ahead.

Send for my free book and learn all about my course—just how I work with my men—how I give them practical work to do—how they secure the aid and advice of my big corps of experts—**No text books—but real work!** That's my method. I can't tell you all about it here—**BUT SEND FOR MY BOOK!**

Send for FREE BOOK!

NOW is the time to get **started on a career.** Send for my free book, and learn all about the possibilities — yes — the **certainties** in the automobile field. You just didn't realize they were there—but I SHOW YOU IN MY BOOK! You can have my **Complete Auto Course** — or you can have a **Special Electric-Auto Course** or a **Special Battery Course.** SEND THE COUPON TODAY!

B. W. COOKE, President

THE COOKE AUTO SCHOOL
Dept. 1358, 500-528 S. Throop St., Chicago

THE COOKE AUTO SCHOOL

B. W. COOKE, President

Dept. 1358, 500-528 S. Throop St., Chicago
Please send me your free book and still information as to how I can become an auto expert.

I am interested in:

- Your **COMPLETE** automobile Course, which covers everything.
- Your **SPECIAL** Auto-Electric Course.
- Your **SPECIAL** Battery Course.

Please print in front of the name you sign!

It is understood I am not under the slightest obligation in asking for this information.

Name _____

Address _____



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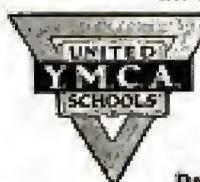
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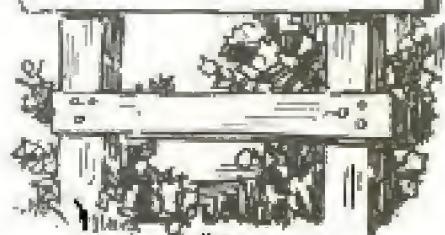
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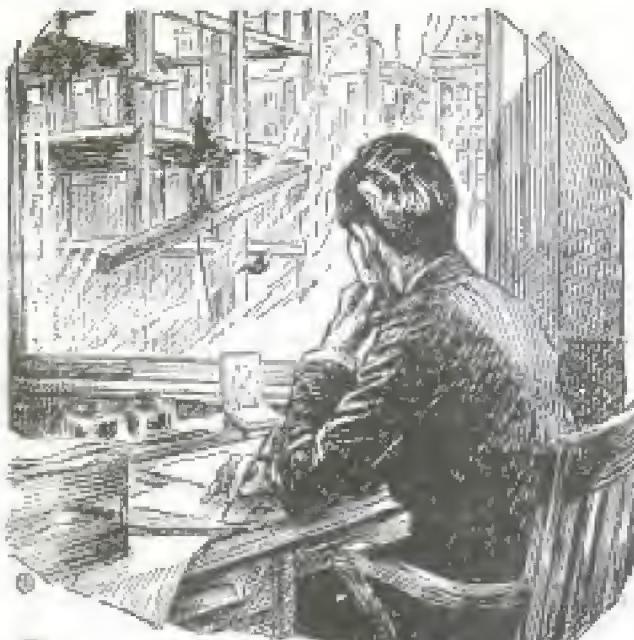
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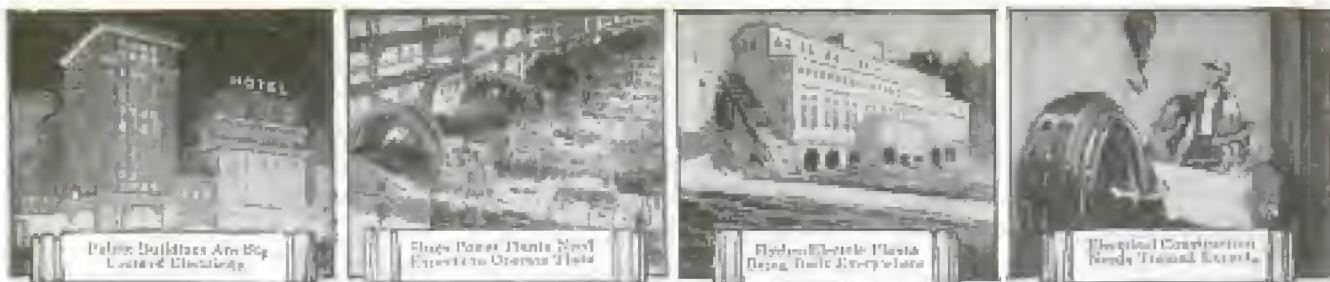
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100% PROFIT—Free Goods—No Investment. High grade guaranteed aluminum metal signboards and cutters. 10 to 15 dollars per day easily made. Perfection Aluminum Mfg. Co., Box A, Lemont, Ill.

MAN or LAD in every town to distribute our 5 Piece Aluminum Handled Cutlery Set. Wholesale or spare time. Experience not necessary. Sells on sight. High Quality Guaranteed. \$10.00 per day to right people. Perfection Aluminum Mfg. Co., Box A, Lemont, Ill.

AGENTS: Jolly Molly dresses are quick sellers—good repeaters. Every woman wants one or more. Complete line now ready. No capital required—no experience necessary. Commissions advanced. Domestic Products Co., 522 Beaver Bldg., Dayton, Ohio.

\$1,000 BEFORE Christmas—you can make it; no experience necessary. Rapid selling \$1.00 household necessity, wonderful gift. You sell, we deliver, pay daily. Address Eastern Krenware Co., Franklinton, N. Y.

AGENTS. Fifty-five Fast Sellers needed in every home. \$5 to \$15 a day easily made. H. & G. Studios Co., 618 Penn Ave., Pittsburgh, Pa., Dept. 181.

"**MAKE And Sell Your Own Goods!**" Tremendous Profits: No experience; No experience; We show you how; Write quick for Free Book. Clover Laboratories, 5301 CK North Weber, Chicago.

LIGHTNING—Strange Battery Compound starts the world. Better than sulphuric acid. Charges discharged batteries instantly. Gallon free to agents. Lightning Co., 81 Paul, Minn.

\$50,000 PROFITS in Portraits. Commissioned artist, samples Free and Unique 20x24, 24-hour service, prints, portraits, frames. Ethelma's Studio, Dept. 8, 673 Madison, Chicago.

WANTED—Agents. Prismet-O-Mat, with name initial, proven big seller; exceptional opportunity; territory going fast. Write Jackson & Co., 216 West 38th, New York.

POLISHING Cloth—easy seller, big money. Hundred other unique specialties. Get this proposition. Address Newton & Co., 82 Main Street, Newark, N. J.

EVERYBODY uses extracts. Sell Our Double Strength Extracts. Complete line household necessities. Big profits. Write today. Dan Co., Dept. E, Atwater, N. Y.

AGENTS—Big Profits. 50¢ seller, office-household necessity. Sample 25¢. Act quick. Address, A. M. Co., Steger, Ill.

AGENTS—Big seller; Jim Rubber Repair for tires and tubes; supercedes vulcanization at saving of over 300%; cost 1¢ an inch, vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube. Sells to every auto owner and necessary dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Amazon Bldg., Philadelphia, Pa., Dept. 505.

WHY work for others? Make and sell your own goods. We show you how. Enormous profits. Write quick for free book explaining everything. National Scientific Laboratories, 211 North Monroe, Richmond, Va.

AGENTS Wanted. On U. S. map. Make your Christmas Money. Sell our exclusive line of engraved Xmas Cards. The very best in design, quality and price. Big commission allowed. No money needed. Write for free samples and particulars at once, as no answers will be considered if received later than November 20th. Knight & Co., Box 276, Ilionton, N. Y.

AGENTS—\$85.00 weekly is a small income if you sell the Erecom (Erecomus-Crestex). Every Catholic will buy for \$2.00, Crestex \$1.00. Your profit 110%. Demonstrating Case free. All houses can use Erecomus Series Plates, Bells and House Numbers. Simple easy sales that bring big money. The Pioneer Corporation, 600 Yale Ave., Chicago.

LATEST: Newell. Biggest seller of the year. Over 300% profit. Melting Tinnes. Requires all kinds of cloth, mattresses, gloves, etc., leather and quaker than needle and thread. Every home needs this. Have others work for you. Sell in stores in almost any gross lots. Sample free. Circle Sales Co., Melrose, Ill.

PATENTS. Protect your rights. Before disclosing invention write for booklet and blank form. Billards of Conception to be signed, witnessed and notarized with rough sketch or model of your idea, name of which I will promptly give opinion of patentable nature and instructions. No charge for preliminary writer. Highest references. Prompt, personal attention. Clarence E. O'Brien, Registered Patent Lawyer, Southern Building, Washington, D. C.

AGENTS: Whitewall Sellers—Men's Diagonal Gas Mask Holders "Aeroyear Braided" costs you dozen lots up \$1.25 each. Women's, \$2.00; Children's, \$1.00. Rubberized Aprons, \$3.00 per dozen. Wonder 3 in 1 Bag, \$2.25 per dozen. Order samples now. Biggest season coming. Profits unlimited. Chester, 202 East 12th St., New York, N. Y.

AGENTS—Sell our Aircraft felt made of all new bright stock. Colors, red, green, blue, tan, etc. If you are looking for something to double your money, send for our sample 25c each, \$1.50 prepaid, and we will show you how. E. C. Conant, 74 Bedford St., Boston, Mass.

\$100 PAID by Schleicher in first twelve hours. Self-selling penposition establishes new money-making records. Automatic hot or cold running water bath equipment, without plumbing or waterworks, only \$7.50. Exclusive territory. Investigate. Send no money. Terms. Write today. Alton Mfg. Co., 678 Alton Bldg., Toledo.

SPECIAL, offer to Agents in limited number offices and towns to sell well-known guaranteed Electric Drill; sells remarkably low price, \$25.00; Agents get \$2.00 each. Present agents averaging over \$100.00 weekly. Only few vacancies left; write at once. Consolidated Instrument Company, 41 East 23rd Street, New York.

MEN with Ford cars to sell the Peter Palm Tire Pump, the only engine-driven air pump for Fords. Pump \$10. No pressure in 30 seconds. No competition—low profit—liberal commissions. Send for circular. George Clappett Manufacturing Co., 611 Pennsylvania Avenue, Washington, D. C.

LIVE agents, either sex, preferable a new article, every housewife likes "Ideal" hemming Dish Towels on sight; easy sales, big profits. Send 25c for sample book and credit coupon if you mean business and want a real leader. Utility Manufacturing Co., Nutrich, Conn.

\$25.00 WEEKLY commissions. Copy money off newest household, automobile specialties—thus on. Every home, garage, automobile, necessary store instantly buys ID to 100%. No money. No experience needed. Exclusive territory going fast. Write quick for free samples. Factory (A), Box 494, Hartford, Conn.

LAUNDRY manufacturer wants agents to sell guaranteed laundry to movie theaters, Gardeines and Restaurants for and saloons combined. Make \$75 to \$100 weekly. Profit in advance. We deliver and collect. Credit free. Standard Laundry Co., 102 West 21st Street, New York, N. Y.

POLITRAIT Agents, who want good work and profit service and who desire to purchase their frames at factory prices, should write us at once for catalog and price list. W. G. Hamm Co., Dept. A-E, 51 E. 18th St., Chicago, Ill.

TAILORING Agents: You can make more money with a one-piece line than with any other. Ours is a better one-piece line. It offers All-Wool Tailor-Made-Suits regular \$50.00 values, at only \$29.50, including a good profit for you. You get your profit in advance with every order. We supply everything. Call us a few trade good men. Write at once. Address: Park Tailoring Company, Dept. 701, Chicago, Ill.

AGENTS: A sale in every home for our beautiful dress goods, silks and general yard goods. Quick sales! Big profit! Large book of nearly 1000 handsome trade samples furnished to agents. Write today. National Importing & Mfg. Co., Dept. 6A, 273 Broadway, New York, N. Y.

Why work for others? Make and sell your own goods. We show you how. Numerous profits. Write quick for free book explaining everything. National Scientific Laboratories, 213 North Moore, Birmingham, Va.

MAKE \$25 to \$50 week representing Clews Famous Philadelphia Hosiery, direct from mill—for men, women, children. Every pair guaranteed. Prices that win. Free book "How to Start" tells the story. George Clews Company, Dept. 31, Philadelphia, Pa.

OUR Ex-Col. Luminous Crucifix glows brilliantly in the dark. Churches, hospitals and institutions are only waiting for a distributor before buying. Agents make handsome profits. W. G. Hamm Co., Dept. H, 51 E. 18th St., Chicago.

MARY J. L. C. P. Bejeweled Jewelry—"mag" pearls that are exact reproductions of real pearls. Women wild for them. Write quick. W. J. Trythall, Importer, Birmingham, N. Y.

TAILORING Baltimore: Make \$75.00 a week selling our strictly All-Wool Made-to-Measure Suits at \$20. You collect profits in advance and keep them. We supply these selling outfit in America. Many exclusive money-making factories. Tailoring, tailoring and side-line men, part or full time, get in touch with us immediately. The Great Tailoring Co., Dept. 161, Chicago, Ill.

AGENTS: Get your money on the spot. \$10 daily demonstrating Betimaks. No waiting for commission or salary checks. No delivering. No collecting. Big bonus just starting. Write or wire Perry Ludlow Co., 2-1962, Dayton, Ohio.

AGENTS: Beverage trailer. Two seats in one. One side glass out, other side, steel, enameled. Guaranteed waterproof or money back. Not sold in stores. Big commissions. Sample furnished. Parker Mfg. Co., Coat 518, Dayton, O.

Gold Letters and Past Sales. Every owner buys Gold Initials for his auto. You charge \$1.50; make \$1.25. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

AGENTS wanted. Act as Jobbers. Advertised products. Hand Cleaner, no water or soap required. Auto polishes, etc. Manufactured under formula Chief Chemist, Lakewood, California. Particulars free. Scientific Mfg. Co., 30 Church St., New York.

CLARKE made \$18 an hour selling window-washer cleaner needed by every hotel, motorman, engineer; one rub keeps glass clear 24 hours; \$0,000 sold; amazing proposition free. Security Mfg. Co., Dept. 617, Toledo, Ohio.

EDGEGEET commission ever paid agents selling standard household articles. Five exclusive specials. Entire first payment about \$10. No collections, deliveries, investment. Easter's patented "Tupper" hand Insures satisfaction. Agent's kit free. National Factories, Tribune Bldg., New York.

WILLIAMS No Water Hamm Shop. 10 tubes. One billion auto owners in stores; washes dirtiest hands perfectly clean without water. Easy demonstration makes quick sale; 100% profit. Address W. H. P. Williams, Mansfield, N. J.

LIVE Agents make \$10 Day selling Elkay Strainer and Splash Preventer for every water faucet. Takes no sight. Widely advertised and known. Get details today. A. H. Seal Filter Company, 72 Franklin, New York.

SALES Representative wanted every country to give all or spare time. Position worth \$1,000 to \$3,000 yearly. No previous experience or capital necessary. Write for full particulars. A. A. Silver-Chamberlin Co., Clayton, N. J.

One reliable agent in every city to sell Penkals, the handiest and most efficient Expedited Pencl, awarded Gold Medal 1915. Big Christmas seller. Sample 50c, worth double. Shuster-Bartes Co., 477 Erie, New Kensington.

ANY man handy with paint brush or light tools can start new mechanical business on nearly nothing; needed everywhere; nearly all profit; experience not required. John Graveline, 1157 So. Ninth, Philadelphia, Pa.

FIRE—Furniture Catalog. B. & H. Laboratories, Building, Chicago.

THE Agents' and Salesmen's Guide, tells where to buy almost everything. The most wonderful list of business opportunities ever published. Only, 25¢. Wilson Publishing Co., 1400 Broadway, New York.

EXCLUSIVE territory for our wonderful fuel economizer using fast. Sells third year root. Fuel节约器 creates large sales. Sample small. Engineer, 151 West 72nd St., New York, N. Y.

RADIOPHONE—special—complete machine under \$10.00. The first payment yours. No investment, collections, deliveries; exclusive territories, sales until free. Patented "Tupper" card winner. National Specialty, 154 Nassau, New York.

MEN'S Shirts. Easy to sell. Big demand everywhere. Make \$13.00 daily. Underwear stores. Complete line. Exclusive patterns. Free samples. Chicago Shirt Co., 9 So. Clinton, Factory 305, Chicago.

AGENTS—Make two dollars an hour. \$20 profit on every size sale. Sells on credit. Sample free. Empire Company Branch, 7201, Atlantic Avenue, Worcester, Mass. Atlantic City, N. J.

STRETCHING Kuff Buttons are sensational sellers; automatically opens and closes when cuffs are raised or lowered. Great convenience. Big money maker. Flexo Mfg. Co., Shreveport, La.

POLITRAIT Agents—Earn big money selling our Photo Medallions. Everybody buys. You charge \$2.00; make \$2.10 each sale. \$10 daily easy. Big variety audience, 4-day service. Perry Photo Novelty Corporation, Section 16, 250 Bowery, New York.

START your own little mail order business anywhere. Home employment offering. Everything furnished. Send stamp for instructive booklet. Address Charles Pier, 74 Cortlandt Street, New York.

MAIZE \$90 weekly plating, refinishing, oxidizing on nickel, silver, copper, brass, iron, steel. Write for particulars. Lancaster-Metalcrafts, 23 West 22nd St., New York, N. Y.

\$60 WEEKLY refinishing, staining, silking of furniture, automobile, picture frames; making lamps, statues, polishes. Forbes-Jameson Chemical Co., 21b East 22nd Street, New York, N. Y.

GET our Big Money proposition and free samples on Easy Applied Transfer Letters and be convinced. Auto Monogram Supply, 16 Green St., Newark, N. J.

MONEY-BACK guarantee makes Premier Sharpeners fastest seller. Hundreds getting rich. You can. Write Premier Mfg. Co., 813 E. Grand Blvd., Detroit, Mich.

A BUSINESS of Your Own—Make attractive glass name plates, numbers, checkboards, installations, signs; big illustrated book free. E. Palmer, 511, Worcester, Mass.

AGENTS—A demonstration sells our Marvel Can Opener, and doubles your money. Clash your success with our proposition. Stagline Mfg. Co., Mt. Vernon, Ind.

AGENTS: Big profits. Best and cheapest window letters made. Easier applied. Dime brings free samples. Particulars free. Stahlrite Co., 1115 Belmont Ave., New York.

THE Sims Shoe Ventilator will relieve your sweaty, tender, sore feet. Agents wanted. Particulars, W. H. Sims, 215 Marion St., Portland, Ore.

AGENTS, mail-order men, beginners, something new. Valuable, Inside information, free. Nile Mail Order & Supply Co., 609 27th St., Denver, Colo.

EARN \$10 daily silvery rollers, plating and refinishing metalware, auto, chandeliers, fireplaces, headboards, furniture. E. Deek Laboratories, 1133 Broadway, New York.

GALLAGHER made \$326.00 in one week selling Satisfaction Collection Systems, used by all business men. Savers Mfg. Co., 2835 Sheffield Ave., Chicago, Ill.

TOBACCO Conqueror Tablets quickly overcome tobacco habit, or stronger habit. Harmless; inexpensive. Details free. Peerless Pharmaceutical Co., 103 Syracuse, N. Y.

AGENTS: Big Money Monogramming by Transfer Method. Catalogue showing over 50 Styles and Particulars free. Mohawk Accessories Co., Mansfield, Ohio.

AGENTS tell Ford Dear Puckets. Every Ford owner a prospect. Write for particulars. English Inn Label Co., Haddon Heights, N. J.

AGENTS: \$20 daily distributing bamboo self-filling greatest mountain jets. Just cut. Sample free. Spom Co., Le Sueur Center, Minn.

"JIMAL" Auto Top Dressing. Big Seller. "Guaranteed." Address, John Byrne, Irvington, N. J.

AGENTS: Send for sample "Frontok"—the whitening wonder. He convinced you can do a whitening business. You can clear at least \$20 to \$100 weekly, according to space of whole time. You don't have to talk; if she doesn't buy at sight, leave sample; she will be looking for you long before you are able to make the rounds again. Samples furnished free. Premiums for your customers. Exclusive territory guaranteed to agents who can produce. Credits given. Don't call. J. M. Motter & Sons, 20 E. Jackson Blvd., Chicago.

AGENTS: \$10 to \$200 a week. Free samples gold and silver sign letters for office windows, store fronts and glass signs of all kinds. Anyone can put them on. No experience necessary. Big demand everywhere. Over 500% profit. Fred Foley, Binghamton, N. Y., made \$125.00 first month. Albert Gibson, Kansas City, made \$212.00 in ten days. Liberal offer to general agents. Write today for sample of our high-grade window letters. Address, Metallic Letter Co., 431-C North Clark St., Chicago, Ill.

AGENTS: Wanted—Something New—Fire Fighter sells easily. Makes a spectacular demonstration; car owners, homes, factories, stores, practically buy on sight. Queen made \$10.00 to \$15.00 a day; exclusive territory. If you wish to establish a business of your own with unlimited possibilities for making big money, write us today. Pyro-Tyre Co., 1102 Fer-Pyre Bldg., Dayton, Ohio.

STAJET is a permanent business of young men selling guaranteed Hysteria and Underwear direct from mills. No capital or experience is needed; many representatives make \$3,600 to \$5,000 per year. Become our district manager—get others working for you. Write for details to Malinich Knitting Mills, 5211 Grand St., Grand Rapids, Mich.

\$5 TO \$15 Daily Easy—Introducing New Style Guaranteed Hysteria. Must wear or replaced free. No capital or experience required. Just show samples, write orders. You pay in advance. We deliver and collect. Elegant outfit furnished all colors and grades including silk—wool and heathers. Mac-O-Ches Mills Co., Dept. 1011, Cincinnati, O.

AGENTS Wanted. In U. S. only. Make your Christmas Money. Sell our exclusive line of engraved Name Cards. The very best in design, quality and price. Big commission allowed. No money needed. Write for free samples and particulars at once, as no answers will be considered if received later than November 30th. Knight & Co., Box 250, Binghamton, N. Y.

AT Last—World's Greatest Adding Machine. Almost instant. Retail \$15; week equals \$300 machine, \$300 monthly easily made, demonstrating in stores, offices, garages, factories. Simple, easy; adds, subtracts, multiplies, divides, automatically. Speedy, accurate, durable, handsome. Five year guarantee. Tremendous demand; amazing profits. Liberal trial offer. Protected territory. Write today. Lightning Calculator Corp., Dept. F, Grand Rapids, Mich.

EVERY Balmoral Agent should set our deposit of \$100. If you have never sold garments and waterproofed overcoats now is the time to start. Any man able to talk is able to sell garments. Write for our "profit sharing, collecting, buying, superior quality" offer. Associate Balmoral Agents, Inc., 542-A North Wells, Chicago.

\$100,000.00 CONCERN wants agents to take orders for Galathine, the Mask Hydrocotton. Biggest selling coat in America today. Wonderful value. Big profit—in all cases. Two sales means big day's wages. Only sample of cloth necessary—furnished free. We deliver and collect. Write today for exclusive territory and selling quota. Dept. 811, Lewis Balmoral Company, Cleveland, Ohio.

EH Motor Makers Large factory offices too big profits on 150 fast sellers. Tell us your needs. Flowering extracts, powders, soaps bring you \$8.00 to \$25.00 daily. News of Illinois makes \$1.00 an hour. Sample outfit free to workers. Lincoln Chemical Works, Dept. 125, 2020 No. Lehigh, Chicago.

EGG Products Selling Now \$2.50 Automatic Adding Machine. Absolutely accurate. Fully guaranteed. Quick sales. Ten daily cases. No competition. Pocket size. Business people everywhere positive customers. Thousands being sold. Tremendous demand. Here's high-grade money-maker. Russell Co., 1488-L, Hollywood Ave., Chicago.

\$1,000 MADE by Wins in six weeks selling New Full Range Shampooers. Purdy made \$10.00 first day. Other unexpected items cleaning up big money. Apple-white, tan, sky orders in thirty minutes. Hurry—investigate—exclusive territory. Write today. Never Fall Co., 153 Allen Hills, Toledo, O.

\$5 TO \$15 Daily Easy—Introducing New Style Guaranteed Hysteria. Must wear or replaced free. No capital or experience required. Just show samples, write orders. You pay in advance. We deliver and collect. Elegant outfit furnished all colors and grades, including silk—wool and heathers. Mac-O-Ches Mills Co., Dept. 1011, Cincinnati, O.

AGENTS—\$12 a day—Easy, quick sales—Fire Auto—Big weekly bonus—\$1.50 pictures free to every customer. Simple show our beautiful, 7 piece, Solid Aluminum Handicraft Cutlery Set. Appeals instantly. We deliver and collect. Pay today. New Era Mfg. Co., 802 Madison St., Dept. 21-E, Clinton.

PATENTS—Write for our free illustrated guide book and Exhibitor of Copyrighted Black Sand sketch or model for our exhibition of its patentable nature free. Highest references. Prompt attention. Reasonable terms. Victor J. Evans & Co., 167 Ninth, Washington, D. C.

\$10 A DAY and More—our new book shows clearly how you may gain sure success and large profits selling Guaranteed Hysteria and Underwear. Factory in family. It is Free. Write today. C. & D. Company, 51-B Grand Rapids, Mich.

GREAT Profits Assured capable man joining immediately national selling organization for Evento Self-Filling Ink-pen-jet pen. Write with ink instead of lead. Need for Profit Proposition. Evento Pen Co., Dept. 24, Grand Rapids, Mich.

SPIRAL Curtain Rods, brass projectiles. Tension Sheet Clips, factory prices. Other fast sellers. Address Hunt Mfg. Co., Box 192-P, Paterson, N. J.

OUR Agents make \$12 to \$20 every day and are getting it with new invention that sells to everybody. Low price. Pocket sample. Write Edward Swan Company, 25 N. Dearborn St., Chicago.

AGENTS—Make big money the year round—selling latest New York fashions, no smart packing and low priced no western can resist buying. Address Simms & Co., Dept. 16, 29 West 30th Street, New York City, N. Y.

PORTFOLIO Agents—Sample Books, Sample Cases and Samples of all kinds furnished in the portfolio trade. Write for catalog. Chicago Sample Book Co., Dept. P, 57 East 18th St., Chicago.

AGENTS—Entomous Profits. Permanent Repeat Business, exclusive territory, selling highest quality products at low prices. Convenient Oil Shampoo retail \$5 bottle, cases \$1 dozen. Soaps, Perfumes, Extracts, etc. P. Venolia Company, 10 East 18th, New York.

MEN and **Women** Make Big Money from Start selling exclusively Dr. Blair's Sunburn Salve preparations for every member of the family. Complete line. Highest permanent, remarkable selling outfit. Write quick. A. K. Blair Laboratories, Lynchburg, Va.

JACO Sanitary Strips sell on sight to everyone using razors. Three dozen \$2.00 delivered; easily sell for \$9.00. \$5.00 Profit, sure every day. Get particular quick. Jay Company, 111 Jay Building, Washington, N. J.

EIG Agent's and Mail Order Magazine of Opportunities and Information. Including "Supply" Guide; Three Months Trial. Harry Temple, Deatur, Ind.

MYSTERIOUS Fiber Novelties, when dropped into water, turn into fish, flowers, animals. Sample shown with price. J. C. Heimann, 7202 Congress, Chicago.

AGENTS—\$40-\$100 weekly easy. 15th century Mantle Brush. High quality, low price. Big commissions. Novelty Brush Co., Hartford, Conn.

YOU can make \$10 to \$20 daily selling Key India Fiber Goods. Outlast three ordinary brooms. 100% Profit. Write Key Fiber Products Company, 145-C New Jersey Ave., Brooklyn, N. Y.

RARN big money fast applying gold leaf dots to ladies. Every owner buys \$1.25 profit on \$1.50 sale—particulars and samples free. Write quick. Jalligram Co., Dept. 17, East Orange, N. J.

FIELD "Amen" Pictures; best-looking, biggest value. Manufactured in western. Every order nets profit \$1.50-\$2.25. Write for winning sales plan. Menzies Shirt Co., 262-A, Third Ave., New York.

AGENTS—New patented curtain rod, necessary in every house, big profits; 4 to 10 sales at every house. Write for free sample. Home Curtains Inc., Providence, R. I.

AGENTS make 500% profit handling Auto Mountaineer, New Pictures, Window Letters, Transfer Flags, Novelty Signs, Catalog Free. Write Hunter Co., Star City, Id.

AGENTS—Stamping names on Pocket Key Protectors; sample check with your name and address, 25¢. Stamping Odette, Embroidered Checks, Check Pads, Name Plates. Stein Mfg. Co., Dept. Z, 201 Broadway St., Brooklyn, N. Y.

AGENTS—New Invention. Hospital Towel Brush Set and Plate Brush. It sweeps, washes and dries plates, windows, carpets and mops floors and does five other things. Big profits; used sellers. Free trial offer. Harper Brush Works, Dept. 72, Fairfield, Iowa.

AGENTS—Innumerable goods selling themselves. Gold Leaf sign letters. Guaranteed not to fade. Excellent a permanent business or resort. Anybody can do it. Free samples. Gurnee Sign Service, A-336 South California Ave., Chicago.

AGENTS—Over one hundred men. Grecian, a \$50.00 fountain pen; everybody buys in administration. Write for big profit plan. Grecian Pen Co., 50-PP 11th St., New York.

AGENTS—Genuine Gold Letters anyone can put on Store Windows. Guaranteed to not tarnish. Large profits. Enduring demand. Free samples. Write today. Genuine Gold Letter Co., 439-A North Clark, Chicago.

HOUSEHOLD and office novelty endorsed by "Good Housekeeping." An article of daily use. Large profits. Everett & Barlow Co., Philadelphia, Pa. 1

AGENTS—Self Patented Cigar Lighters and Case-Case Holders. Big Profits. Start making money at once. Write for catalog, cuts and sales plan. Dealer Mfg. Co., Dept. M, Milwaukee, Wis.

AMBITIOUS Men, write today for attractive proposition, selling subscriptions to America's most popular automobile and sportsman's magazine. Quick sales. Big profits. Pleasant work. Digest Pub. Co., 2000 Butler Bldg., Cincinnati, O.

2200 WEEKLY, Free samples. Sell gold sign letters to stores, offices. No experience, big future guaranteed. Can travel. Exclusive territory. Become our general agent. Anne Letter Co., 2500D Congress, Chicago.

MAKE 100% Profit, Free Samples. Lowest priced gold writing letters for stores, offices. Anybody can do it. Large demand. Exclusive territory. Big future. Sideline Anne Letter Co., 2500-D, Congress, Chicago.

COLD sign letters for stores and office windows. Photo pillow tops, picture frames, sheet pictures, medallions, water-proof autographs, novelties. Samples, catalogue free. Thirty days credit. James C. Bailey Co., Desk J-11, Chicago, Ill.

AGENTS make a dollar an hour. Sell Micros, a patent patch for instantly mending tears in all garments. Sample package free. Collector Mfg. Co., Dept. 404-N, Amsterdam, N. Y.

AGENTS, \$15.00 a week for spare time. Books \$13.45, postage \$3.45 up. Money-back guarantee. Guaranteed Quality. Line well known. Samples free. Write Chicago Tailor Association, Dept. 106, Chicago.

GREATEST Sensational Eleven-piece soap and toilet set, selling like狂es for \$1.75 each. All distributor's share free to each customer; other unique plans. E. M. Davis Company, Dept. 506, Chicago.

AGENTS—Buy new fast-selling novelties; big demand; unique selling point; makes dollar an hour; credit given; samples free. Consolidated Portrait Co., Dept. E, Chicago.

CALIFORNIA Rosebuds selling like hot cakes. Agents selling money; new staff. Big profits. Catalog free. Mission, 2421-P, MI, Smith, Detroit.

SOFT Wonderful Seller, 90% profit every dollar. No stock to carry. Unique commodity. Sample free. Mission, 2421-MI, Smith, Detroit.

CARHAGIE Cutler, 5 cutters, slices 20 vegetables. Larger than aluminum, never dulls. 20,000 users throughout states. Endorsed by Time Housekeeping Institute. Agent's Sample free. Meyer Co., Oakland Ave., Cleveland, Ohio.

AGENTS—Cheese Inventor! Inksoom makes easy pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Morris Company, Tribune Bldg., New York, N. Y.

EAST, plenteous work for Mechanics, Shop Men, Clerks, during spare hours; will add more clients in their territory. Also want persons who can give free time. Big wages assured. Newark Coffey Co., 97 Broad St., Clinton, N. J.

MAKE big money selling our stamped 21-jewel watches. Case gold filled, engraved; warranted 25 years. Sales easily made. Sample, 45-75. Osbin & Co., 3925 N. Kimball Ave., Dept. 400, Chicago.

AGENTS—Men, women, to sell Pure Silk Blouse closer to wearer. Commissions paid daily. Full compensation on all repeat orders. We deliver and collect. Write Norwalk Hostess Mills, Norwalk, Conn.

SELL Novelties. Inexpensive novels and books the "Business Guide." Recent cleared \$800.00 in July. Send for sample. It's free. Nichols Co., Box 4-B, Naperville, Ill.

PROFIT selling our tel rings to homes, hotels, offices, etc. Everybody buys. We are manufacturers, not jobbers. Price steady competition. \$75.00 week easy. Newark Bell Ring Company, 36-Q Bergen Street, Newark, N. J.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Returns credited. Prompt shipments. Send for latest catalog and prices. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago, Ill.

AGENTS: Big profits. Greenleaf Gold Leaf Window Letters, signs, car and map, scripts and 57 varieties. Chicago Agency Co., 842 Alleged St., Chicago.

BEST Proposition on Earth. Kitchen Specialty Every Woman Wants. Nothing like it in existence. 200% profit. Best Novelty Mfg. Co., Dept. C, 260 N. Wells, Chicago.

We start You Without a Dollar. Soap, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Creation Co., Dept. 201, St. Louis.

SKILPOLITE—Agents. Structures—Bellville lights any fire while user sleeps, or any time. Performs surprising stunts. Newly patented. Sample free, postpaid; money back. Particulars. Kaywo Mfg. Co., 1125 Section A, Boston, Mass.

SOMETHING New! Men and Women make \$500 a month. Write for particulars. The K. Products Co., 6053 Huron Ave., Detroit, Mich.

AGENTS: Make 500%, Toilet articles, Perfumes, Extracts, Household necessities. Sample Case Free. Lillington Co., Dept. A, Mahn and Walnut, St. Louis, Mo.

LARGE Shirt Manufacturer wants Agents to sell complete line of shirts direct to wearer. Exclusive patterns. Big values. Free samples. Madeline Mills, 501 Broadway, New York, N. Y.

WANTED—District Purchasing Agents, \$250 per month. Steady employment and exclusive territory. Write now. Experienced controller. National Instrument Company, 4781 North Hamilton, Chicago, Ill.

I AM making \$20 daily. You can begin with my plan and instructions. Price \$1.00. Scott, Box 301, Globe, Ariz.

SALESMENT. Art Quirk, Two patented auto novelties. Spark plugs, visors, windshield cleaners, base cleats, etc. Gathers commissions. Jubilee Mfg. Co., 23 2nd St., Omaha, Neb.

AGENTS: Big Income, fast action sellers; particular and samples free. One Dip Pen Co., 2 Baby Record, Baltimore, Md.

FIFTY "Ideal" Binders for Mail Dealers and Agents. 500% profit. K. Home, 1607 Wabash, Chicago.

RAUMSAGE sales make \$50.00 daily. We send you. Representatives wanted everywhere. Permanent business. "Dresser Co." 607 Division St., Chicago.

CARL Log Sign Letters; make and sell; profits exceed 1,000%. Immense demand; particular free. Johnston Co., Quincy, Ill.

HOUSEHOLD necessities; cost 2c, sells 25¢; sample free. Stein, 1515 Minneapolis, Minnesota, N. J.

"ROMAN'S-Three-Games." Agent's commissions and profits, 10c. Boston Arnold, Detroit, Mich.

Why work for others? Make and sell your own goods. We show you how. Numerous profits. Write quick for free book explaining everything. National Scientific Laboratories, 211 North Murray, Indianapolis, Ind.

CARRIAGE Cutter, 5 knives, slices 20 vegetables faster than blanching, never dulls. 20,000 users. Cincinnati alone, endorsed by Good Housekeeping Institute. Agent's com- pany, Inc., Meyer Co., Grand Ave., Cincinnati, Ohio.

AGENTS: Sell Wolverine Laundry Soap, 150 other household necessities. Big line. Big Profits. Quick repeaters. Free information. Exclusive territory. Write quick. Wolverine Soap Co., Dept. K, Grand Rapids, Mich.

KIDNEY Burners for cooking and heating horses and furniture. The Holland Standard burner. The best burner—the best Agent's terms. Write for terms and territory. Holland Brass Works, 638 West Monroe, Chicago, Ill.

EXTRAORDINARY Household Free. We will send a Kidneyburner Unpriced. All Weather Coat to one person in each locality who will show and recommend it to friends. Write today to The Gomelco Mfg. Co., 1549-C Goodyear Bldg., Kansas City, Mo.

SILK "Shyn-Rite," Webit's greatest polish. Fast action. Sure repeaters. Big profits. Exclusive territory. Free Sample. Learn what "Shyn-Rite" actually does—then you will sell it. Heaton Products Co., 1224 Clybourn Ave., Chicago.

27,000 TELEGRAMS guaranteed with one Remington Phonograph Needle; new—different; cannot injure records \$10.00 daily case. Free sample to writers. Everyplay, McClung Bldg., Desk 106, Chicago.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Returns credited. Prompt shipments. Send for latest catalog and prices. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago, Ill.

MEN and Women wanted everywhere to sell "Clean" Washing Compound direct to homes. 300% profit. Easy to sell. Dev Haven Manufacturing Co., 314 Garfield Avenue, Chicago.

AGENTS—Very latest police articles, perfume and novelties. Fast sellers. Sure repeaters. Big profits. Free sample case. Lee-Jackson Co., Arcadia 3, Cincinnati, Ohio.

A WONDERFUL Seller. Any man, woman, boy or girl can make big wages. Same agents make from \$8.00 to \$20.00 per day. Crimp Grip Clothes Line Fasteners are a simple, time-saving device for holding a rope—also used for many other purposes. It pays for itself quickly in time saved on wash days. No knots—it fastens and releases quickly. Every home is a prospect. Every housewife who uses Crimp Grip—and there are thousands of them—is a customer. That is but one Crimp Grip. Write for particulars, or send me the one you have and a mounted sample with full particulars to agents. Crimp Grip Company, Belvidere, Illinois.

GOOD income, spare time, refurbishing chandeliers, brass beds, reproductions, etc., by new method; producing amazing results; every household possible customer; extensive universality; simple plan of manufacturing at home starts you in big money-making business. Write for free samples, showing fixtures, etc. Commercial Finish Co., Ave. H, Decatur, Ill.

NATURE Your Shop. Don't spend a Penny for formulas or information to "make and sell your own goods" till you've received my Valuable Literature and many Lists of Guaranteed Reliable Formulas for Manufacturing Mixed Selling Specialties in all lines. 26 years supplying the best. Miller Chemist, 833 DeLeon, Tempe, Arizona.

CENTRAL Indiana Manufacturers now marketing an entirely new and necessary item that makes night driving safe, eliminating glare from approaching headlights. Want general sales managers to open branch office. Handle exclusive territory and no trade-smen. Some investment necessary. Profit possibilities practically unlimited. Jay Auto Fitter Co., Marion, Ind.

\$8.00 to \$20.00 per day. A wonderful seller. Any man, woman, boy or girl can make big wages. Selling Crimp Grip Clothes Line Fasteners. It is a perfect rope holder and can be used for many purposes. Crimp Grips are a simple, time-saving device. They last a life time and will not rust. It holds the line tight, and saves time on wash days. Every buyer is a customer. Send me for Mounted Sample and one pair of Crimp Grip Clothes Line Fasteners. Write for particulars. Crimp Grip Company, Belvidere, Illinois.

AGENTS: Men and women, in spare or full time, make big money selling household novelties. Every home a prospect. Quick sales, big profits. Territory open. Write for particulars. Judd & Ireland Manufacturing Company, Box 21, Elkhorn Springs, N. Y.

AGENTS: Sign Market Director. Free. Showing where to buy over 1,000 different items in the sign line. Address Attractive Sign Works, P. O., Union, P. O., Chicago.

"POLAROID" Polishing Cloth claims all metals. Results 25c. Sample free. Gale & Co., Inc., 15 Edith St., Boston.

SILK Like Hot Cakes; big profits; new lining was just and asbestos free; clamp board; perfumes clothes; outfit 10c. Yankee Mfg. Co., 380 Atlantic Ave., Brooklyn, N. Y.

AGENTS—Big profits. Gold Sign letters easily applied. Samples free. Liberal offer to General Agents. Dept. C, Interstate-Sign, 2620 No. Halsted St., Chicago.

SOMETHING new! Siannine, 200% profit. Retail 10c to houses and offices. Gile & Co., Inc., 25 Edith St., Boston.

MAN wanted in every town. Nos. 515 Halligan Bldg., Chicago.

"HOW to Sell Patents" Inc., Patent News, Washington, D. C.

MAKE \$50 Daily. Something new! 400% profit. All business professionals must need it. Sales \$5. Case #1, Brooks, Texas, sold 20 that day, profit \$40. Big weekly reporter. Selling quickly. Experience unnecessary. Write today for territory required. Sample copy free. Federal Association, 21-E Ashton St., Hartford, Conn.

MEN—Women. Make \$8 daily representing established ladies' corporation. Introduce guaranteed silk hosiery to friends and others. We deliver and collect. Write Free. Empire Hosiery Corporation, 1829 Broadway, New York.

\$100-\$150 EARNED weekly selling ladies', men's, children's and household furnishings from Illustrated catalogues. Send for details. Talby Mfg. Co., 177 Blackstone St., Boston, Mass.

PROFIT: Household, Store and Office Supplies. Free sample. Address Chapman Co., 229 Dwight Bldg., Kansas City, Mo.

AGENTS make \$11.00 daily introducing Lubricant Carbon Receiver. Particulars free. Address A. C. Sullivan, Palmyra, N. Y.

AGENTS—Dope dead trees. We have a 25c seller. Universal Milk Bottle Cork. Every housewife wants it. Makes every milk bottle a sanitary, air and water tight pitcher. Cannot spill. Samples 25c. Writer, K. Z. Art Needle Co., 515 N. Dearborn, Chicago.

PROFIT. Snow Dust reaches clothes without rubbing. Washes cold about 12. Going big everywhere. Free samples. Exclusive territory. Norman C. Cornell, Webster, Ind.

If you need good live agents—follow those who can get the business—ask me how others are doing it. I'll gladly render the necessary assistance. J. Roy McClellan, 3201 Chicago Advertising, Popular Mechanics Magazine, Chicago.

HIGH-GRADE SALESMEN WANTED

EVERY man wears shoes; we want salesmen everywhere to take orders for our special made men's shoes, direct to market; good commission, experience unnecessary. Write Doctor Slagle Co., Brookline, Mass.

Two Oklahoma side line salesmen are averaging \$15.00 daily—with Ross Special Fountain Pen, selling to dealers. Try it. D. N. Ross Co., Tulsa, Okla.

SALESMENT—Side-line men calling on Hardware, Garage and Auto Accessory Trade. Big Commissions. Pecked Sample, Everett Manufacturing Company, Maywood, Ill.

4-U-1-C-K—Your big opportunity, 100% profit. Gourmet Auto Wrecker Co., Topeka, Kansas, Dept. P.

SALESMAN calling on Garage and Tire trade, side-line or full line. Wonderful product. Address Randolph Co., St. Paul, Minn.

WEBS you ever offered a specialty store? You can handle Sights, Floor, Chained Trends, Indian Traps, coats and entire line of preserves, as well as Balloons, Needles, Aluminum Ware and Automobile tires, with no fleet or pay; no money invested. Take large orders from samples. Goods are guaranteed and proven quality. Selling experience not necessary. Steady, profitable work for "workers." Address Hitchcock-Hill Co., Park 20, Chicago, Ill. Reference: Am. Bank & Exchange Co.

HIGH-GRADE Specialty Salesmen Wanted—Something New—Fire Fighter sells easily. Makes a spectacular demonstration; car owners, homes, factories, stores, principally buy on sight. Our men make \$10.00 to \$50.00 a day; exclusive territories. If you wish to establish a business of your own with unlimited possibilities for making big money, write us today. Fire-Fighter Co., 1150 Fire-Fighters Bldg., Dayton, Ohio.

SALESMAN's Rights. Shows why no license is required. Gives legal facts and advice which will enable you to avoid trouble from local or state authorities. Money back if you do not think this book worth \$25.00 to you. Mailed on receipt of \$1.00. Address R. S. Hill, 38-G, W. Kinzie St., Chicago.

MINUTES per dollar demonstrating world's greatest specialty. Wonderful new three-pound Adding Machine. Retail \$15. Work equals \$100.00 machine. Adds, subtracts, multiplies, divides, automatically. Speedy, accurate, durable, inexpensive. Five-year Guarantee. Tremendous demand everywhere. Amazing profits, male or female. Experience unnecessary. Write quick for liberal trial offer and protected opportunity. Lightning Calculator Co., Dept. G, Grand Rapids, Mich.

AGENTS—\$60-\$200 a week. Free samples. Hold signs letters anyone can put on store windows. Liberal offer to general agents. Metallic Letter Co., 401-H N. Clark St., Chicago.

EASY to sell Groceries, Paints, Automobile Oils, Bottling, Stock Food to consumers from samples, no capital or experience necessary; steady, profitable work. Commissions advanced. Satisfaction guaranteed. 29 years in business. Write for full particulars. Lowerin & Bruns Co., Wholesale Grocers, 1775 S. State Street, Chicago, Ill.

MAKE \$6,000 every year—\$2,000 in spare time. You share profits besides. Show "Weather Measure" Raincoats and Water-repellent Overalls. Ask about "Dead Coal" (No. 299). Get sample catalog free. Associated Raincoat Agents, Inc., 316-A North Wells, Chicago.

TERITORIAL and local salesmen. Clemax Oil Burners heated residence furnaces burns kerosene. Scientific principles prevent smoke and soot; side-line spectra. No demand. E. L. Miller Mfg. Co., 2221 West Third, Kansas City.

AMBITIONUS Men, write today for attractive proposition, selling subscriptions to America's most popular Automobile and sportsman's magazine. Quick sales. Big profits. Pleasant work. Direct Pub. Co., 2560 Butler Bldg., Cincinnati, O.

SALESMAN: If you want \$6,000 this year, write me. Strong line for retail stores, nationally advertised. Liberal weekly advances to producers. W. Morgan, Mgr., 1929 Euclid, Cleveland, Ohio, Dept. 200.

SALESMAN need of automobile and machinery who likes to talk about them to solve their difficulties, and to make them run smooth under all conditions, can make a connection worth \$2,000 to \$10,000 in an automotive accessory line which will keep him happy and contented. Prefer man without salesmanship experience to used salesman who doesn't like machinery problems. Permanent and will be as big as the man himself. Write what you've done and what you'd like to do. Bulger's Company, A. St., Florence, S. C.

ADVERTISING and Mobility Salesmen of ability, experience and large earning capacity can succeed with manufacturer's letter and advertising specialties. In ready demand among banks and big business concerns. Fine contract, count-on basis, \$150 on single order not unusual. Selling aid extended. Write us fully about your experience. David H. Bell, Inc., Dept. F, 512 Broadway, New York.

SALES District Managers Wanted for Dominant Mac-All Polish, the new wonder that is being adopted everywhere. If you have small capital, we can make you a remarkable offer, one that will put dollars in your pockets while you are making cents now. Exclusive territory granted. Department Products Co., 161 South St., New York City.

MANAGERS Sell Tailoring—one of the most profitable of all lines, the better supply line of Guaranteed All-Wool suits at \$10.75 tells all. Every order pays you a good profit, in instance. Experience not necessary. We supply everything. This is a rare opportunity. Get the facts—today. Park Tailoring Company, Dept. 550, Chicago.

CLEATHING Salesmen Wanted at once to sell High Grade Virgin Wool Custom Tailored suits and garments direct to wearer at \$28.00. Satisfaction guaranteed, big commissions; experience not necessary; exclusive territory to man who qualify. House of Campbell, 456 S. State, Chicago, Ill.

ONLY one policy a day means \$120 per month profit, same on renewals. Policy price \$5,000 death; \$25 weekly benefit for injury or sickness. Premium \$10 yearly. Full or spare time. Ease sellers. Write quick for reciprocity. Underwriters, Dept. K-3, Newark, N. J.

ST. MILES per gallon shale with new patent granular vaporizer. Write for particulars. Vaporizer Co., Pulaski, N. Dak.

SALESMEN—Sell "Zim's Peerless"—the "Chumblinger" collection system. Exclusive collecting features makes sales easy. Merchants buy "Zim's Peerless"—and other system wide. It's the seller, best! Switch leading. Creditors' Association, 312-E McKnight Blvd., Minneapolis, Minn.

SALESMEN, Local or Traveling, make \$30 a week selling our advertising novelties. Largest assortment on the market. Calendars, Penlets, pocketbooks, notepads, etc. Liberal terms. Future your proposition. Publishing Mfg. Company, South Bend, Ind.

SALESMAN—Create profitable incomes. Easy selling, low overhead necessary. Coal situation makes publishing distributorship ideally profitable. Free training and selling helps assure workers big success. Write or wire. Crown, Richmond, Ind.

SOMETHING New, a necessity. All business and professional men need it. Sells \$7.50, costs you \$1.10. Big requester. Write for sample. Streetcars Assn., Minneapolis, Minn.

SALESMEN make good side money selling small automobile tools to garages and shops. Easy to sell. St. Paul Welding & Mfg. Co., St. Paul, Minn.

SALESMAN wanted with car, \$300 weekly. Sell new tires, tubes to car owners. Commission in writing. Experience unnecessary. No investment. Manager, 1414 Wabash, Chicago.

SALESMEN, Are Quick. Ten patented auto necessities. Spark plugs, risers, windshield cleaners, hose clamps, etc. Complete catalog. Jubilee Mfg. Co., 22 8th, C. Tumon, N. Mex.

NEED Investment Salesmen! "Advance" Advertising, nationally used system, attracts "spectators"; eliminates canvassing; closes sales. Address Board Plan, Buffalo, N. Y.

MAKE \$50 DAILY. Something New! 400% Profit. All Business. Professional Men Need It. Sells \$5. Costs \$1. Wichita, Texas, sold 20 first day, profit \$30. Big weekly repeat. Sells quickly. Experience unnecessary. Write today for territory wanted. Sample gratis. Federal Association, 71-D Lexington St., Hartford, Conn.

INVESTITRATORS—Invest your chance! Want it? Miss Clever Little "Cataract" Washer; cleaning takes quickly. Attaches to Garden Hose. All Brass—can't rust. Won't wear house furnish. Everybody your customer. Three Styles—No. 1, \$2.50; No. 2, \$1.75; No. 3, \$1.25. Alluring profits. Quick shipments. Cataract Auto Washer Co., Topeka, Kan.

HELP WANTED

DISTRICT Managers—Big Profits. Men capable of organizing and managing crews of Italy soldiers can easily earn \$50 to \$100 per week with the H. & A. Protector, the original and most progressive on the market. Every weapon between officers and privates and more. Two grades, H. & A. Protector Co., Dept. 180, 618 Penn Ave., Pittsburgh, Pa.

SALESMEN. Independence awaits the late winter who grasp this opportunity. Warehouses, terminals, shipyards companies, factories, hotels, cafes, etc., desperately need our scientific, positive, but simple method of extermination of rats and mice; grateful clients and long contracts await you; best exclusive territories going fast. Commission only. Write day-by-day. The Ratite Laboratory, Inc., 115 Broad St., New York.

AGENTS: Cost \$5.00 per year profit \$20.00, transferring immigrants on autos, trucks, boats, furniture, etc. No experience, no license. Write for free samples. Transfer Management Co., Inc., 10 Orchard St., Dept. 151, Newark, N. J.

BEC a Pioneer Print Export—Opportunities opening everywhere. Write National Bazaar, 186 East 16th, New York.

CREW Managers—Xmas, Tag and Seal Packages. 25 pieces in each 10c package. \$4.00 hundred postpaid. Cash with order. Your profit \$2.00 hundred if you pay Boys and Girls Tax for selling it. Send \$1.00 for 25 packages and get a salesman display sheet. Detroit Parcel Post Co., 808 Water St., Utica, N. Y.

\$5 TO \$15 Daily Ease—Introducing New Style Guaranteed Hosiery. Most wear or replaced free. No capital or experience required. Just show samples, write orders. Your job in advance. We deliver and collect. Elegant outfit furnished all colors and grades including silk-worsted and cashmeres. Mac-O-Cheer Mills Co., Desk 1512, Cincinnati, O.

SALESMEN—Become independent. Own your business; experience unnecessary; selling our \$7,500 Accidental Death, \$50 Accident, \$25 Sick Weekly Benefit; \$12.50 yearly; other amounts proportionate. Guaranteed steady income from renewals. \$250,000 deposited. Insurance Department. Registration Dept. A, Newark, N. J.

GOVERNMENT Clerical Positions open to Men, Women, Girls 18, over; Postoffs, Railway Mail, Departmental. Other Positions. Good salary. Experience unnecessary. Examination soon. Full particulars. Mrs. Weiss Columbia School Clerk Service, 411 Pope Bldg., Washington, D. C.

FIREMEN, Brakemen, Baggage, Sleeping Car Train Porters needed. \$140-\$200. Experience unnecessary. Atto Railway Bureau, East St. Louis, Ill.

AMBITIOUS Men, write today for attractive proposition, selling subscriptions to America's most popular Automobile and sportsman's magazine. Quick Sales. Big profits. Pleasant work. Digest Pub. Co., 1505 Butler Bldg., Cincinnati, O.

SALES Letter Agents and Painters: 50% Profit. Gold and Silver Signs Letters for Stores and Other Windows. Atomic and Magnetic Letters Co., 4112 N. Clark St., Chicago.

ALL men, women, boys, girls, 17 to 60, willing to accept Government Positions, \$137-\$150, traveling or stationary. Write Mr. Gambel, 101, St. Louis, immediately.

STORIES, poems, plays, etc., are wanted for publication. Good ideas bring big money. Submit manuscripts or write Literary Bureau, 322, Louisville, Ky.

MEN wanted to qualify for Firemen, Brakemen. Transportation furnished. Write W. Biggers, St. Louis.

MEN—Over 12. Become U. S. Government Railway Mail Clerks. Big opportunity. Commence \$135 month. Quick, sure rise to \$185. Pleasant work, traveling constantly. Every second week off—with pay. No layoffs. Common education sufficient. Full unnecessary. Write immediately for free U. S. Government positions open. Franklin Institute, Dept. K-3, Rochester, N. Y.

UNITED States Government Wants Men, Excellent positions at attractive salaries. Railway Mail Clerk Examination area. Let our expert (former United States Civil Service Examiner) prepare you for this and other fine positions. Write today for free catalog PM. Passenger Civil Service School, Worcester, N. Y.

\$50,000 SALES of a \$12.50 household appliance in New England have paid salesmen \$25 to \$150 weekly. We want District Managers of exclusive territory elsewhere to sell direct or obtain sub-agents. The Home Cleaning, 95 Broad Street, Milford, Conn.

HAVING sold 150,000 of a household appliance in New England we now offer direct salesmen and district managers in other territories equal opportunity to earn from \$2,500 to \$5,000 yearly. The Home Cleaning, 95 Broad Street, Milford, Conn.

100 a Railway Traffic Inspector! \$110 to \$250 monthly; expenses paid after 3 months' space-time study. Splendid opportunity. Position guaranteed or money refunded. Write for free booklet CM-46. Stand. Business Training Inst., Buffalo, N. Y.

MEN—We want a man in every shop to sell our hand cleaner to fellow-employees. Now, different. Not a soap nor paste. Demand growing rapidly. Big profits. Write Fort Orange Chemical Co., Albany, N. Y.

START your own little Mail Order business anywhere. Home employment available. Everything furnished. Stamp before indicating booklet. Address Dalton Pier, 71 1/2 Franklin Street, New York.

YOU are wanted. Commence \$135 month. Government Railway Mail Clerks. Ready. Common education sufficient. Write immediately for fine positions open. Franklin Institute, Dept. K-3, Rochester, N. Y.

\$60 WEEKLY refurbishing, staining, gilding of furniture, antiques, picture frames; making cornices, stencils, pictures. Furniture Painted. Chippend. Co., 210 East 2nd St., New York, N. Y.

EARN \$10 daily straight incomes, staining and refinishing metalware, radios, chandeliers, brackets, headboards. Quality furnished. E. Deets Laboratories, 1135 Broadway, New York, N. Y.

MEN. Women, over 18, desiring Government positions, \$1,000 up, write immediately for full information. Chicago Civil Service College, A-41 Keener Building, Chicago.

WANTED: Railway Mail Clerks—\$1,000 to \$2,500. Exams everywhere. Write today for full information. Patterson, Civil Service Expert, Box 4625, Rochester, N. Y.

OUR genuine gold window sign letters are an excellent money-making proposition for lonely men. Signs Sign System, St. Anthony St., Detroit, Mich.

\$92-\$125 MONTH. Men, Women over 37. Steady U. S. Government positions. List free. Write immediately. Franklin Institute, Dept. K-21, Rochester, N. Y.

WRITE Articles, stories, news, in spare time for newspapers and magazines. Big pay. Copyright blank free. Press Syndicate, 203, St. Louis, Mo.

\$125 MONTH commercial. Steady Government Railway Mail Clerks. List positions free. Write immediately. Franklin Institute, Dept. K-21, Rochester, N. Y.

SILVERING mirrors, French plate taught, easy to learn. Immense profits. Plans free. Wear Mingo Weeks, Excelsior Springs, Mo.

YOU are wanted. Government jobs. \$105 monthly. Write for list. Franklin Institute, Dept. K-21, Rochester, N. Y.

MAKE money writing Photo-plays; details free to beginners. No correspondence course. Penwriters' League, 230 Waukegan, St. Louis.

START Silvering Mirrors, Auto Headlights, Tableware, etc. Plans free. Clarendon Speckle, Dept. 28, Market, Ind.

3000 words in spare time. Full particulars 10 cents. Delmar Company, N. J.

LOCOMOTIVE Firemen, beginners, \$100. later \$250 monthly, for railroads nearest their homes, everywhere in United States and Canada. Address Railway Association, Desk M-1, Brooklyn, N. Y.

INVENTORS desiring to secure patents should write for our book, "How to Get Your Patent," tells one terms and methods. Small sketch for our opinion of its patentable nature. Randolph & Co., Patent Attorneys, 620 F, Washington, D. C.

FOR ADVERTISERS

TENS of thousands maintain New York addresses. Why? How to increase your advertising results. Free. D. C. Way, 45 New St., New York.

ADVERTISERS will advertise your business or product. Samples for stamp. Labarre Company, Pittston, Pa.

ADVERTISE in 26 big Sunday Newspapers, 25 words \$15.00. Catalog listing 1,000 leading Dallas, Weeklies, Magazines, do stamps, Union Advertising, Baltimore 18th, Chicago.

INTERNATIONAL Opportunity: a live, inspiring, interesting magazine! Six months 25c. International circulation! Ads. 10 words. 2279 First Ave., New York.

ADVERTISE Your ad in 100 magazines for 10 cents per word. Sample copy 10c. Harter Smith, 1021 State Ave., Cincinnati, Ohio.

YOU 25-word advertisement in 100 magazines \$1.00. Hargrave, 1517 South 48th Court, Chicago, Ill.

COMMERCIAL Engraving and Printing—the most practical and complete book on engraving, printing and allied subjects ever published. Over 800 pages and 1,500 illustrations, presenting over 2,500 distinct ideas on 35 separate subjects. Cloth, Price \$3.00 prepaid. We highly recommend this book. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

INCH Display Advertisement. List Magazines Thirty \$15. Year \$50. Page \$1.00. What's Popular Services, Atlantic City, N. J.

ADVERTISING? We write, illustrate and print it. Jacobs Advertising Service, Irvington, N. J.

ADVERTISERS! Great results by advertising in West Virginia Advertiser. Classified Ad. Order today! E. J. Evans, Box 428, Weston, W. Va.

SIGNS AND ADVERTISING

THE creating of a good impression is one of the most profitable forms of advertising, and a very good way to create such result is by the judicious use of Morgan Signs. Morgan Aluminum and Brass Cast Signs and Memorial Tablets are everlasting, economical and artistic. Circular upon request. Morgan Sign Co., Dept. K, 402 W. 27th St., New York City.

INFORMATION

RELIABLE Information furnished on any subject or money refunded. The Co-operative Service Times, Plaza, Box 344, Brooklyn, N. Y.

BUSINESS SERVICE

INCORPORATE. Our lawyers do the work, saving you time, attorney and expense. In Incorporating under the most liberal laws of Arizona. Banks and firms face. Southwestern Securities & Investment Co., Box 1038, Phoenix, Ariz.

MAILING LISTS

ADVERTISERS get our lists. Jacobs Advertising Service, Irvington, N. J.

NORTH DAKOTA State—New list \$2.00 premium, actual farmers, \$15.00, or \$2.00 thousand; 4,000 Dodge owners, \$2.00; 4,000 Chevrolet owners, \$2.00; 50,000 Ford owners, \$20.00 or \$2.00 thousand. All lists up-to-date, up-to-date. Business Service Company, Bismarck, N. D.

ON request the Trade Circular Addressing Co., 104 W. Adams St., Chicago, will send their general sales list showing 3,000 classified mailing lists. Including Radio Hams,

TYPEWRITERS AND SUPPLIES

SIMPLEX Typewriters \$1.50. Remingtons, \$12.50. Demo, Bimonthly Court, Providence, R. I.

TYPEWRITERS, all makes, largest stock, lowest prices, all rebuilt, refurbished and guaranteed five years, shipped with privilege of one month's free trial. Underwoods, Remingtons, Olivettes, \$15.00 up. Send for our lists and agents' premiums before purchasing. Typewriter Exchange, 23rd University Ave., New York City.

TYPEWRITERS. All makes, state-of-the-art. Thoroughly rebuilt in our factory by the famous "Young Process." Fully guaranteed. Free trial. We handle all standard makes. Cash or credit on easy terms. Write for Catalog. Young Typewriter Co., Dept. 414, Chicago, Ill.

UNDERWOOD Typewriters at far less than manufacturer's price; rebuilt, all worn parts replaced, guaranteed good as new. Cash, installment payments. Write for Catalog 1518. Sherman-Ward Mfg. Co., 1818, Monroe and Raviniawood Ave., Chicago, Ill.

REBUILT Typewriters—all makes—\$10.00 and up. One price \$10. to 20 percent lower than installment houses. Every machine fully guaranteed. Send for free catalogue. Accurate Typewriter Exchange, 26 No. Wells Street, Chicago.

TYPEWRITERS, all standard makes, \$10 up. Fully guaranteed. Free trial. Write for Illustrated Bargain List. Northwestern Typewriter Exchange, 320 West Geetha St., Chicago.

HIBBONS, 33c, Visibly Makes. Typewriter Supply, 7027-29 Coffey Ave., Chicago.

DUPLICATORS AND DEVICES

"MODERN" Duplicators save time, labor, and money. Gets Business, Reproduces Typewritten or Printed Letters, Drawings, Lessons, Music, Menus, Bills, Notices, Specifications, Maps or anything in one or more colors. Prints Two per minute. Special Sale On. 50 Days Free Trial. \$2.25 up. Booklet Free. J. M. Durkin-Harris Co., Pittsburgh, Pa.

NEOSTYLE Mimeograph No. 5, \$25.00; Underwood Reversing Mimeograph, \$20.00; Joseph Berg, Hendrum, Minn.

YOU can make 50 to 100 copies of a letter, Notice, etc., at a cost of three cents on a Heier Quality Duplicator. Write for free trial offer. The Heier Duplicator Co., 162 No. Wells St., Chicago, Ill.

ADDING MACHINES

FREE Trial. Marvelous new Adding Machine. Adds, Subtracts, Multiplies, Divides, automatically. Work equals \$750.00 machine. Price only \$15.00. Speedy, durable, handsome. Five-year guarantee. Used by largest corporations. Write today for catalog and free trial offer. Lightning Calculating Co., Dept. B, Grand Rapids, Mich.

NEW \$2.50 Automatic Adding Machine, Adds, Subtracts, Multiplies. Absolutely accurate. Capacity 1000,000. Fully guaranteed. 10,000 pleased users. Makes adding easy, positive, quick. Eliminates mistakes. Same Time, Postpaid, 33-1, Business Co., 1458-K, Hollywood Ave., Chicago.

PRINTING, ENGRAVING AND MULTIGRAPHING

REDUCED prices for letter printing, 1,600 Bond letter-heads, 25¢; 1,000 good envelopes, 24¢; 1,000 four-page folders, 35¢; 3½ inches, \$2.50. Catalogues, circulars, booklets, our specialty. All printing at reduced prices. Samples free. Fantaus, 325 S. Dearborn St., Chicago.

150 NOTECARDS, 100 white envelopes printed and mailed \$1.00. Samples printing from Address Books, Milwaukee, N. Y.

12 CHRISTMAS Cards, Steel Engraved design—appropriate for anyone—will greet and name. Process Engraving in Old English or script, postpaid \$1.25. Send check or Money order. Universal Process Engraving Co., 302 No. State Street, Chicago.

HEFTER Printing prepaid, for less money. Samples for stamp. Write today. Model Company, Manchester, Iowa.

2,000 LETTERHEADS or Envelopes \$6.25. Postpaid. 2nd issue. Samples Free. Quality Printshop, Marietta, Ohio.

SOMETHING New—Patented Book Form Seal, Grain Card Case and 100 paneled business or calling cards, 45 cents. Agents invited. Sample case 15 cents. Anderson Co., Oconto, Wis.

PRE-USED Printing Presses, Type and supplies. Job for stamp. Popular Bargains. Highland, Pa.

IMITATION Typewriter Letters, Multigraphing, Micrographing, Printing, Cal System, Fairview Station, Decatur.

GOLD lettered advertising-notecards for you; buy direct, save extra middleman's profit. Samples free. Inc. address. Address, S. Mutual & Co., 422 Walnut St., York, N. Y.

HAMMERMILL Bond Letterheads, Envelopes, Billheads, Statements, Cards, Tags, Labels, 150, \$1.00; 250, \$1.50; Job, \$2.50. Race Printing Company, Hudson, N. Y.

TRY our attractive business letterheads on 20-lb. unmarked bond. \$1.25; \$2.50; \$5.00. \$10.50. E. Foster, Clintonville, Conn.

100 PERSONAL or Business Cards with leatherette case, \$1.00 prepaid. Five samples. Ashurst, Lincoln Novelty Co., Rockford, N. Y.

1000 PRINTED Envelopes or Letterheads \$2.00. Sent prepaid. Samples free. Specialty Print, 1001 E. 25th Ave., Denver, Colorado.

MAIL beginner's special: 100 letterheads, 100 envelopes, 100 return, \$1.50 for all. Work guaranteed. Spalding's Priority, West Newton, Mass.

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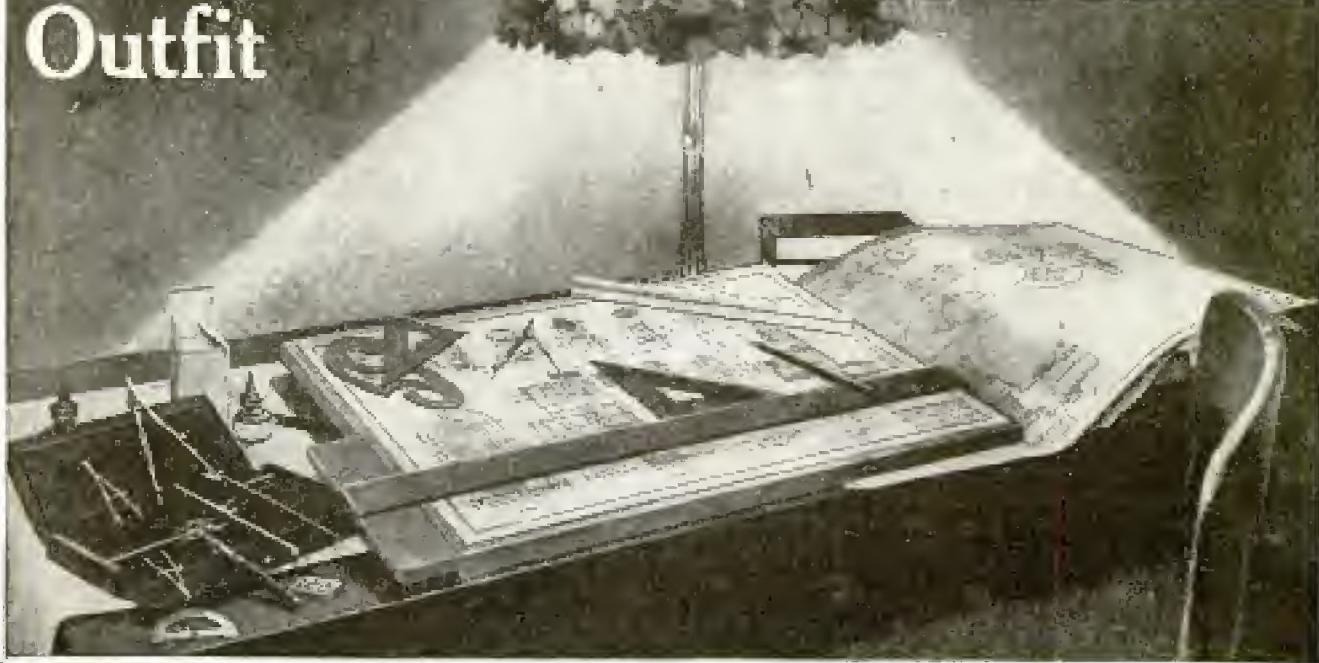
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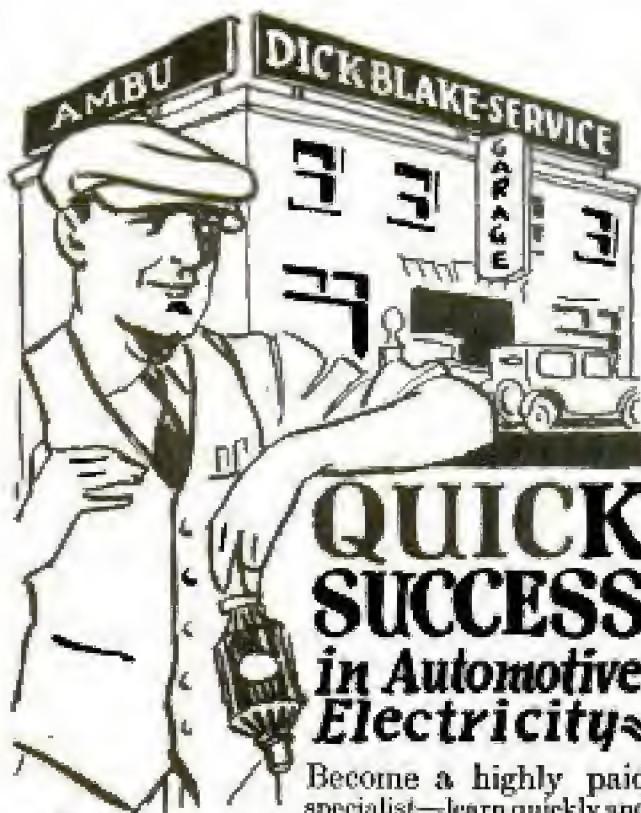
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Can You Guess This Man's Age?

See if You Can Tell Within 25 Years; The Author Couldn't; But He Stuck With Hobart Bradstreet Until He Revealed His Method of Staying Young

By WILLIAM R. DURGIN

I USED to pride myself on guessing people's ages. That was before I met Hobart Bradstreet, whose age I missed by a quarter-century. But before I tell you how old he really is, let me say this:

My meeting-up with Bradstreet I count the luckiest day of my life. For while we often hear how our minds and bodies are about 50% efficient—and at times feel it to be the truth—he knows why. Furthermore, he knows how to overcome it—in five minutes—and he showed me how.

This man offers no such bromides as setting-up exercises, deep-breathing, or any of those things you know at the outset you'll never do. He uses a principle that is the foundation of all chiropractic, naprapathy, mechano-therapy, and even osteopathy. Only he does not touch a hand to you; it isn't necessary.

The reader will grant Bradstreet's method of staying young worth knowing and using, when told that its originator (whose photograph reproduced here was taken a month ago) is sixty-five years old!

And here is the secret: he keeps his spine a half-inch longer than it ordinarily would measure.

Any man or woman who thinks just one-half inch elongation of the spinal column doesn't make a difference should try it! It is easy enough. I'll tell you how. First, though, you may be curious to learn why a full-length spine puts one in an entirely new class physically. The spinal column is a series of tiny bones, between which are pads or cushions of cartilage. Nothing in the ordinary activities of us humans stretches the spine. So it "settles" day by day, until those once soft and resilient pads become thin as a safety-razor blade—and just about as hard. One's spine (the most wonderfully designed shock-absorber known) is then an unyielding column that transmits every shock straight to the base of the brain.

Do you wonder folks have backaches and headaches? That one's nerves point toward the end of a hard day? Or that a nervous system may periodically go to pieces? For every nerve in one's body connects with the spine, which is a sort of central switchboard. When the "insulation," or cartilage, wears-down and flattens-out, the nerves are exposed, or even impinged—and there is trouble on the line.

Now, for proof that subluxation of the spine causes most of the ills and ailments which spell "age" in men or women. Flex your spine—"shake it out"—and they will disappear. You'll feel the difference in ten minutes. At least, I did. It's no trick to acquire complete spinal laxation as Bradstreet does it. But like everything else, one must know how. No amount of violent exercise will do it; not even chopping wood. As for walking, or golfing, your spine settles down a bit firmer with each step.

Mr. Bradstreet has evolved from his 25-year experience with spinal mechanics a simple, boiled-down formula of just five movements. Neither takes more than one minute, so it means but five minutes a day. But those movements! I never experienced such compound exhilaration before. I was a good subject for the test, for I went into it with a dull headache. At the end of the second movement I thought I could actually feel my blood circulating. The third movement in this remarkable Spine-Motion series brought an amazing feeling of exhilaration. One motion seemed to open and shut my backbone like a jack-knife.

I asked about constipation. He gave me another motion—a peculiar, writhing and twisting movement—and fifteen minutes later came a complete evacuation!

Hobart Bradstreet frankly gives the full credit for his conspicuous success to these simple secrets of Spine-Motion. He has traveled about for years, conditioning those whose means permitted a specialist at their beck and call. I met him at the Roycroft Inn, at East Aurora. Incidentally, the late Elbert Hubbard and he were great pals; he was often the "Fra's"



HOBART BRADSTREET, THE MAN WHO DECLINES TO GROW OLD

guest in times past. But Bradstreet, young as he looks and feels, thinks he has chased around the country long enough. He has been prevailed upon to put his Spine-Motion method in form that makes it now generally available.

I know what these remarkable mechanics of the spine have done for me. I have checked up at least twenty-five other cases. With all sincerity I say nothing in the whole realm of medicine or specialism can quicker re-make, rejuvenate and restore one. I wish you could see Bradstreet himself. He is arrogantly healthy; he doesn't seem to have any nerves. Yet he puffs incessantly at a black cigar that would floor some men, drinks two cups of coffee at every meal, and I don't believe he averages seven hours sleep. It shows what a sound nerve-mechanism will do. He says a man's power can and should be unslated up to the age of 60, in every sense, and I have had some astonishing testimony on that score.

Would you like to try this remarkable method of "coming back?" Or, if young, and apparently normal in your action and feelings, do you want to see your energies just about doubled? It is easy. No "apparatus" is required. Just Bradstreet's few, simple instructions, made doubly clear by his photographic poses of the five positions. Results come amazingly quick. In less than a week you'll have new health, new appetite, new desire, and new capacities; you'll feel years lifted off mind and body. This miracle-man's method can be tested without risk. If you feel enormously benefited, everything is yours to keep and you have paid for it all the enormous sum of \$3.00! Knowing something of the fees this man has been accustomed to receiving, I hope his naming \$3.00 to the general public will have full appreciation.

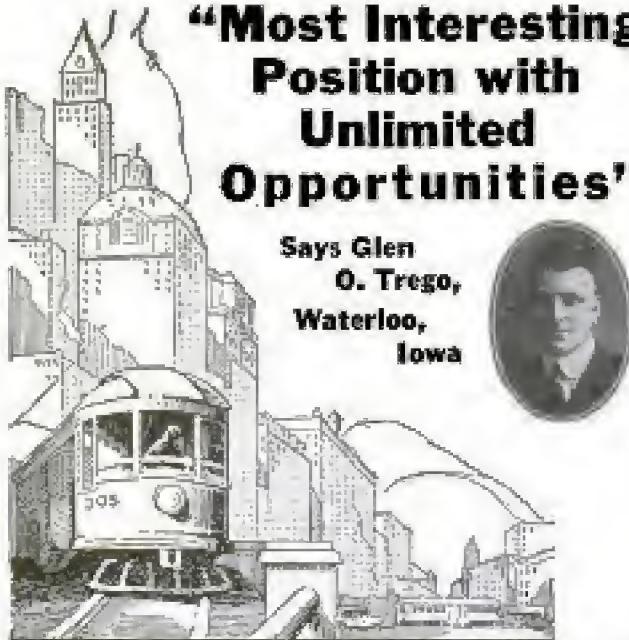
The \$3.00 which pays for everything is not sent in advance unless you prefer. Just pay the postman who brings it. Requests will be answered in turn. Try how it feels to have a full-length spine, and you'll henceforth pity men and women whose nerves are in a vice!

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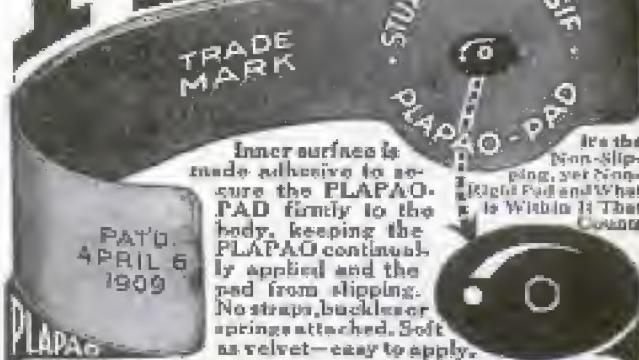
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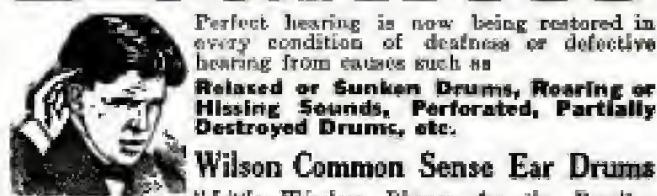
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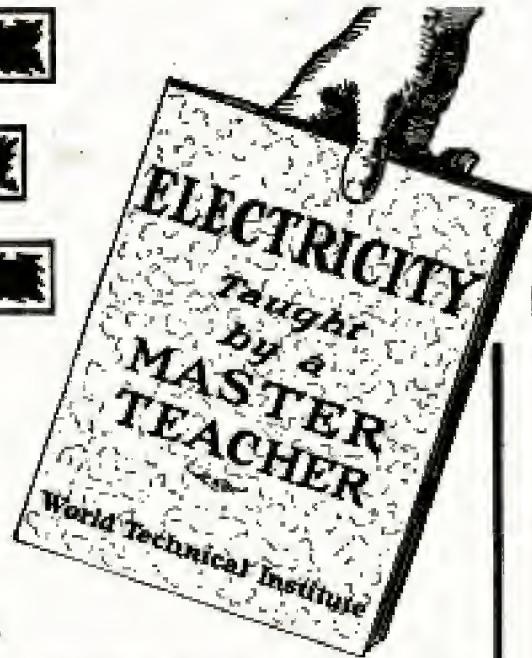
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To show you how easily anyone can learn to dance at home without music or partner, Arthur Murray has consented to send, for a limited time only, his

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Why We Pay Jackson \$10,000 a Year- *for looking out the window*

The secret that makes Arthur C. Jackson one of the most valuable men in our company

By George C. Kendricks
Treas., The Kendricks, Hadley Co., Inc.

A FEW weeks ago, one of our assistant bookkeepers came to me, with an anxious look on his face and asked for a raise. I didn't give it to him and told him why. He was very much peeved.

"Look at Jackson," he argued, "I think he gets away with murder. Keeps looking out the window half the time, yet you pay him \$10,000 a year. But I can't get even a \$10 raise on a \$35 a week salary. Just goes to prove that getting ahead in business is purely a matter of luck or . . ."

"Jim," I cut in, "don't take it so hard. You're young and over-ambitious. I know you mean well but you don't seem to realize that the biggest salaries go to men with the best IDEAS—not to those who merely work hardest."

"But—"

"No buts about it," I told him, "I can get thousands of men like you for less money too! You just mentioned Jackson. Well, I honestly wish we had twenty men like Jackson. We'd pay each of them \$10,000 and have them all look out the windows. And our business would increase at least twenty times! You think Jackson gets away with murder? You're wrong. Do you know who developed the Bonus Plan that nearly doubled our sales last year? Jackson! Do you know who worked up that Sales Promotion System that lined up every dealer in the Central West? Jackson! He evidently snatched these wonderful ideas from the window. And about that new Perpetual Inventory System we're working on now—whose idea do you suppose that is? Jackson's of course!"

"You're right—Jackson doesn't do much work. But he can *think up big ideas—and that counts!* Anybody with a little intelligence can follow instructions—but very, very few can create real money-making ideas. If we lose Jackson we lose one of our biggest assets; if you go—well, we can get 500 more ambitious young men like you in twenty-four hours. Isn't that so?"

"Jackson wasn't born a business wonder! On the contrary he was far lower down the scale at your age than you are now! At 25 years of age he was only a departmental clerk in a big mail-order house. Then he switched to this concern. I remember when he came. Honestly, he looked anything but a successful young business man. I put him just where you are today. Only he was 25 years old at the time. For three years he plodded along, just like thousands of other men."

"Then one day he seemed to wake up. He was no longer timid, or backward in any way. He was no longer shy, and he spoke like a man who was sure of himself! At first I thought someone must have died and left him a million—else how on earth could he become so self-confident and assertive almost overnight? But I was mistaken."

Jackson had discovered the wonderful secret that opens up untold avenues to success. He knew just what to say and how to say it. He seemed to lift out of the air almost unheard ideas—wonderful ideas about increasing this business! Natur-



ally we had to promote him. And we kept on promoting him and raising his pay every few months. Today at 33, he earns \$10,000 a year and is worth every cent of it! To tell you the truth, we don't know when he will end—if he merely requested a raise of \$35 a week, we'd have to give it to him—and the same would be true of you if you could come across with such ideas.

"And just think only five years ago he was just a mediocre clerk—just a cog in the wheel like countless other men and women. Often have I tried to copy the secret out of Jackson but it was only recently he let me in on it.

"In a very few words it's merely developing your will power to swing the inactive nine-tenths of your brain into action. That sounds like deep stuff—but it's very simple. It's a proven fact that most of us go through life using only one-tenth of our brain power. And the only way you can acquire 100% brain power is through your Will. It's just as easy to develop your will power as it is to develop the muscles on arms and legs. You begin to reap the fruits of your labor right away. You're able to control the undesirable ideas and put across the valuable ones; you're able to remember better, to think clearer—and to actually do the right thing at the right time. According to Jackson the whole secret is contained in a wonderful book called 'Power of Will.' I advise you to read it. It made Jackson the big business man he is today. I'm sure it will do the same for you."

"This remarkable book is written in simple language as entertaining as it is instructive and profitable. It will give you the power to create big ideas and show how to drive them home with great force. It will teach you how to make quick and accurate decisions and carry them thru all obstacles with an ease that will amaze you."

"I strongly advise you to get in touch with the Publisher of that astonishing book. It will make you more valuable to us and to yourself. It tells you far better and in greater detail than I can, the amazing secrets that make some men succeed where others fail. You can't lose anything because you can examine the book five days free before you decide to keep it. I'm willing to wager that one week from today you'll be worth \$75 a week instead of only \$35, and if you read the book as carefully as I want you to we'll be more than glad to pay you even more!" Pelton Publishing Co., 13-T Wilcox Block, Meriden, Conn.

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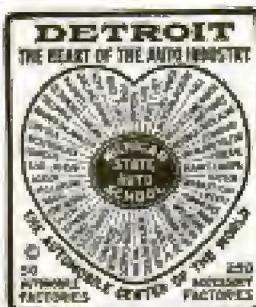
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We guarantee that a graduate of our Automobile and Tractor Course will be qualified to fill a position as assembler, assembler, fitter, repair man, auto electrician, chauffeur, tractor operator, or farm lighting expert, or we will refund his tuition fees.

With Detroit training at the M. S. A. S. graduates are successful—we have trained more than 18,000 men who are located in all parts of the world, either holding big pay jobs or in business for themselves. Thorough training in our excellently equipped school fits our graduates for success. Men leave our school to go right into business and make money from the start—it's the M. S. A. S. thorough training that makes the successes. There's really no limit to the money that can be made.

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As many cars were produced in the first six months of this year as in all of 1921. This will be the biggest year in the history of the industry. 11,750,000 cars now in use and only 60,000 garages. Think what this means—an average of 235 cars for each garage. You can easily see the urgent need for more garages. Think of the eleven million batteries to be replaced or replaced, sixty million tires to be repaired or new ones sold. Can you think of a better business to get into? Thousands of repair shops are needed now, thousands of trained men to run them. Now is the time to get started.

\$220,000,000 This Year for Roads

Beginning July 1, 1922, the Government will spend through the Agricultural Department in one year over 220 millions of dollars for good roads. These roads will be built in every state for National Parks and Forests' roadways, besides thousands of miles will be added to present roads. This means more touring, more business, more heavy trucking between cities, and best of all, thousands of more trained M. S. A. S. graduates with new garages.

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Start Any Time

You start the day you arrive, if you wish. The welfare department arranges for fine rooms and board. You have nothing to worry about—just get right down to business. The instructions are very practical and easily understood—no previous automotive experience is necessary. Now is the time to get started.

Jump on the Train and Come Now

Hundreds of men have just walked, but after reading our advertisement have jumped right on the train and come to Detroit. The factory says you will make no mistakes by coming to the M. S. A. S. The tuition is reasonable and board and room moderate in price. There never was such an opportunity to save. If you prefer, just fill in the coupon and mail it in care. It will bring you Catalog, Auto News and complete information FREE.

Michigan State

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Study and

Learn Now—it is the thoroughly trained men who make the big successes in the auto, truck and tractor business. M. S. A. S. training will make you independent the rest of your life. You will secure in a few weeks of pleasant, practical study and training what hard times or adverse conditions can never take from you. Trained heads and hands always get first call on big money and in business.

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The M. S. A. S. is the original and only factory endorsed school. Ours is the only factory outlined course. The manufacturers and their service managers assisted us in outlining our course. They know it is right. They say you will make no mistake in attending the M. S. A. S. They heartily endorse our school and employ our graduates. Write to any automobile factory, business house or bank in Detroit and ask them about us.

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Factory Trained Instructors

Many of our instructors had early training in the big factories—they practically grew up in the business. Those who did not, have gone into the factory methods in co-operation with the factory heads and give you the result of this intense research and training.

Complete Auto, Truck and Tractor Course

Our complete course includes training in the construction, operation, upkeep and repair of automobiles, trucks, tractors, farm lighting plants and stationary engines of every kind. Basically the instructions are alike, but we teach how to apply the knowledge to all motor vehicles. We have a large general garage for actual garage practice. We own a farm with all types of tractors for operation and upkeep practice. The course includes thorough training in automotive electrics with actual practice in overhauling, rebuilding all types of starting, lighting and ignition systems. You get everything from A to Z. We educate the head and train the hand in a thorough, complete way. Approved by the automobile industry.

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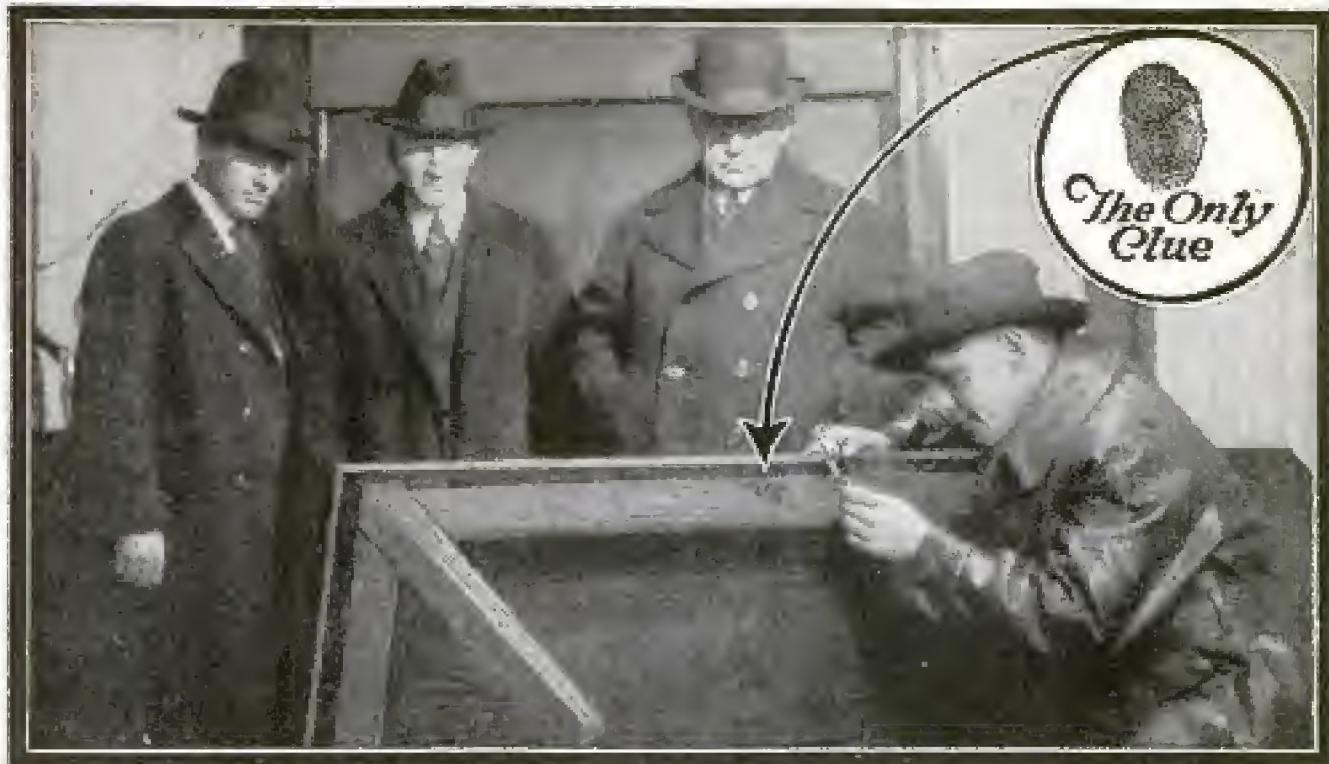
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WARREN BIGELOW, the Finger Print Detective, was making his usual review in the morning newspapers. He had just finished reading the press reports of the daring robbery of the offices of the T-O Company when the telephone on his desk rang. Central Office was calling, asking him to come immediately to the scene of the robbery.

Although he drove his high powered roadster rapidly and arrived very shortly at his destination, he had plenty of time to consider the main features of the case as reported by the press. The job had undoubtedly been done by skilled cracksmen and robbers of uncommon nerve. Sixty-five hundred dollars in currency—the company pay-roll—were gone. Not a single, apparent clew had been found by the police.

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Almost immediately Bigelow turned his attention to a heavy table which had been tipped up on its side. Examination of the glossy mahogany showed an excellent set of finger prints. The thief might just as well have left his calling card.

To make a long story short his prints were photographed and taken to Central Office, where they were matched with those of "Big Joe" Moran, a safe blower well known to the police. Moran was subsequently caught and convicted on Bigelow's testimony and finger-print proof. Most of the money was recovered. In the meantime the T-O Company had offered a \$500.00 reward, which was given to Bigelow—his pay for two hours' work.

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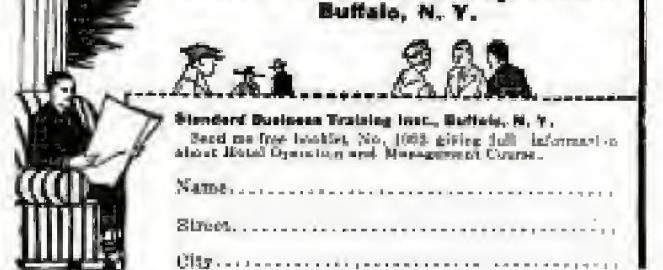
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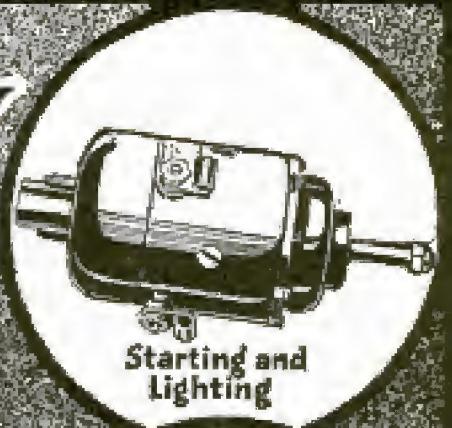
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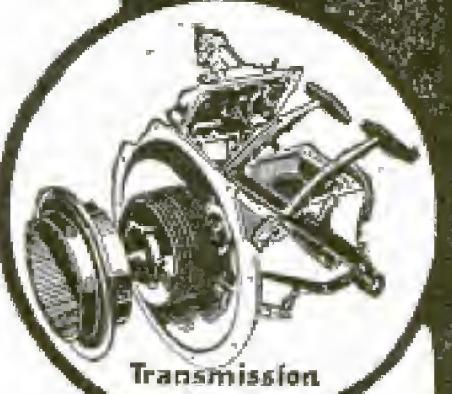
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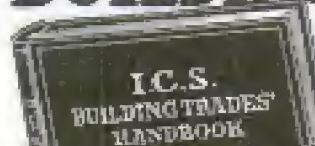
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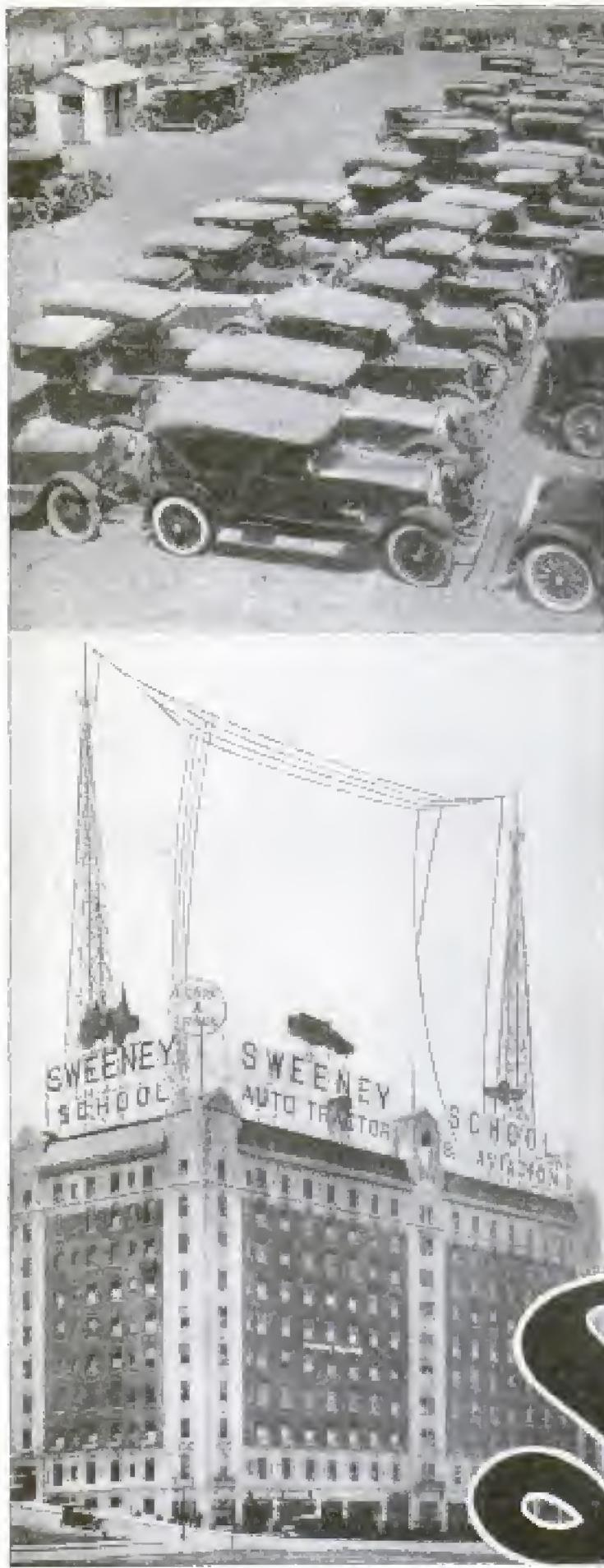
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STATEMENT OF THE OWNERSHIP, MANAGEMENT & CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF POPULAR MECHANICS MAGAZINE, published Monthly at Chicago, Ill., for October 1, 1922.
State of Illinois, County of Cook.
Before me, this 1st day of November, 1922, personally appeared H. H. Windsor, who having been duly sworn according to law, deposes and says that he is the editor and business manager of the publication named in his affidavit, and that he is the sole owner of the same, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in his above affidavit, required by the Act of August 24, 1912, embodied in section 442, Postage and Revenue, printed on the reverse of this form, to wit: 1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Popular Mechanics Co., 8 No. Michigan Ave., Chicago, Ill.; Editor, H. H. Windsor, 8 No. Michigan Ave., Chicago, Ill.; Managing Editor, J. L. Peabody, 8 No. Michigan Ave., Chicago, Ill.; Business Manager, H. H. Windsor, 8 No. Michigan Ave., Chicago, Ill. 2. That the owners are the same as the names and addresses of stockholders coming or holding 1 per cent or more of the total amount of stock; H. H. Windsor, 8 No. Michigan Ave., Chicago, Ill.; L. B. Winsor, 8 No. Michigan Ave., Chicago, Ill.; First Trust and Savings Bank, Trustee for H. H. Windsor, 8 No. Michigan Ave., Chicago, Ill. 3. That the known bondholders, mortgagees, and other security holders owning or holding ten per cent or more of total amount of bonds, stocks, or other evidence of debt are: None as yet issued. 4. That the corporation has not during the six months past given to the trustee of any stockholder any preference held over the stock of the company, but also that the stockholder, as trustee, holds no preference over the stock of the company. 5. That the corporation has not during the six months past given to the stockholders or security holders on their respective books the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements concerning affairs of the corporation and beliefs as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees hold stock and securities in a capacity other than that of bona fide owner, and this officer has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds or other securities than is indicated by him. 31. H. H. WINDSOR, Editor. Sworn to and subscribed before me, this 22nd day of September, 1922. J. G. GILBERT, Notary Public. My commission expires June 17, 1924.



MEN write

I Pay Your and guarantee

**Eleven Million
Automobiles!**

In every place in the U.S. you can see this scene—cars waiting for the mechanic—11,000,000 cars in the U. S.—millions of jobs for young men. Start in with the easiest job of all—a chauffeur.

I say a chauffeur gets \$90 to \$150 a month. I know, I pay my own driver \$125 a month and board and lodging, so that he has a pretty nice job and saves good money. He has a lot of fun driving around and making trips and seeing the world. He is treated right; he gets as good food as I do and as soft a bed to sleep in. I think on the whole he has a better job than mine because he hasn't a worry on earth. Well, the chauffeur job is the easiest and most simple job of all, the first step up the ladder.

If you want to be independent and do the work you like and get real money now is the time to start. You haven't any idea of the possibilities in the auto business. Let me tell you what I can do for you.

LEARN A TRADE

Now is the time for you to learn a trade. I teach men to be successful auto mechanics. Can you make a tire? Can you weld a broken crank case? Can you build a battery? Can you repair an automobile? Can you go anywhere in the U. S. and get a job in a garage, repair shop, auto agency, tire shop, welding concern? Can you get a job as a driver or chauffeur?

**LEARN A
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WANTED today to Sweeney

**Ry. Fare to K.C.
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You Must Apply Now**

If you are ready for PROFITABLE EMPLOYMENT after eight weeks' training, write me today. Do not delay—for this opportunity may not occur again. For when these jobs are filled, I cannot offer such employment agreement any longer.

For fifteen years I have trained young men mechanically inclined. This is the first time I have been able to GUARANTEE A JOB. And I can only guarantee a certain number. But you can be one of those who take training UNDER MY GUARANTEE OF EMPLOYMENT IF YOU ACT NOW. Please do not apply unless you are willing to take eight weeks' course of training.

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The first step is to send me the coupon or write a postcard for my 72-page illustrated catalog. It tells all about this

Million Dollar Trade School. How thousands of men just like you, without any special knowledge, but simply a liking for mechanics, MADE A LIFETIME SUCCESS as a result of this simple training.

I don't care how old you are. I don't care how small your education, for I teach with TOOLS, NOT BOOKS. I need 5000 salesmen and representatives to handle Sweeney batteries and radio supplies. I want managers for branch offices. I will hire you if you are in earnest and will qualify. And if you are willing to go to work, I WILL PAY YOUR RAILWAY FARE to Kansas City. Write me NOW! No colored students accepted.

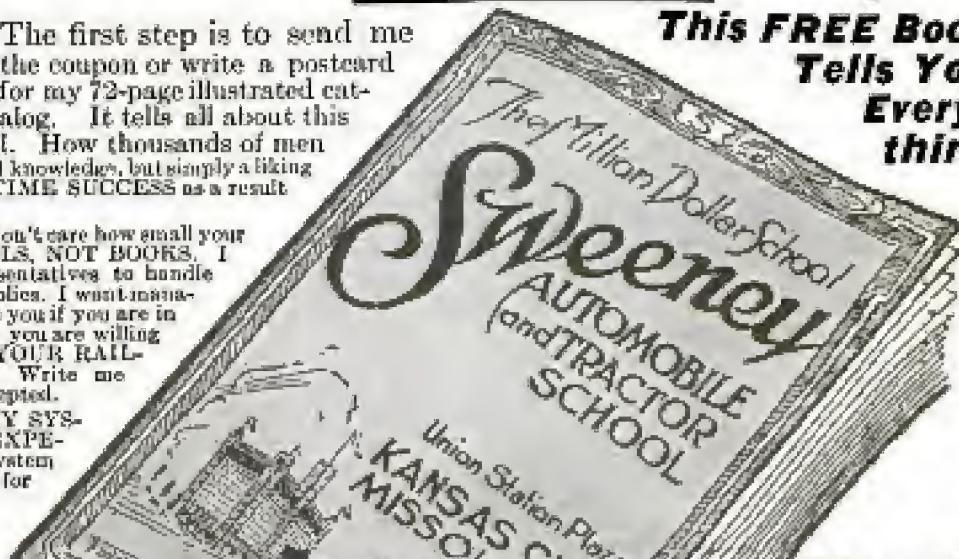
You cannot get the SWEENEY SYSTEM OF PRACTICAL EXPERIENCE anywhere else—the system that trains men in eight weeks for big paying jobs.

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"I start tomorrow, Mary, at an increase of \$60 a month. It's wonderful how spare-time study helps a man to get ahead."

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An Architect, A Painter and A Sculptress Joined in Designing This Exquisite Lamp

The lines, proportions and coloring of most of the lamps you see in these days of commercialism are the work of designing departments of large factories. They are the fruits of a deep knowledge of what makes a "popular seller." But some people, the **Decorative Arts League** committee felt sure, would like a lamp designed purely with an eye to good taste, a lamp of artistic proportions and harmonious tones, a lamp embodying grace, symmetry and beauty rather than the long experience of the "salesman-designer" of what seems most in demand.

In retail stores, Hence this exquisite little lamp you see pictured, "Aurora" as it has been named by an artist, because of the purity of its Greek lines and tones.

A Labor of Love

For the delicate work of designing a lamp that should be a real work of art instead of a mere unit in a factory's production, and yet should be a practical and useful article of home-furnishing, the League enlisted the enthusiastic cooperation of a group of talented artists—one a famous architect skilled in the practical requirements of interior decorating, one a painter and genius in color-effects, and one a brilliant sculptress, a student of the great Rodin in Paris.

They caught the spirit of the League's idea and the designing of a lamp that would raise the artistic standards of home-lighting became to them a true labor of love. Model after model was made, studied and abandoned, until at last a design emerged with which not one of the three could find a fault.

Every Detail Perfect

One style of ornamentation after another was tried out, only to yield in the end to the perfect simplicity of the classic Greek lines. Even such a small detail as the exact contour of the base was worked over and over again until it should blend in no-continuous "circum" with the lines of the slender shaft. The graceful curves of the shaft itself, simple as they seem in the finished model, were the results of dozens of trials. The shape, the exact size, and the soft coloring of the shade were the product of many experiments.

The result is a masterpiece of Greek simplicity and balance. Not a thing could be added or taken away without marring the general effect—not the sixty-fourth of an inch difference in any moulding or curve but would be harmful. And yet with all the attention to artistic effect the practical knowledge of an experienced interior decorator has kept "Aurora" in perfect harmony with the actual requirements of the home. It blends with any style of furnishing, it adapts itself to boudoir or foyer-hall, to library or living room. And wherever you place it "Aurora" will add taste and refinement besides furnishing, with its tiltable shade, a thoroughly practical and mellow light wherever required.



"AURORA"
\$3.50

In the exclusive Fifth Avenue type of shops, where lamps that are also works of art are shown, the equal of this fascinating little "Aurora" if found, would cost you from \$15 to \$20—perhaps more. Yet the price of this lamp is but

\$3.50 — Think of it!

Only the Decorative Arts League could bring out such a lamp at such a price. And only as a means of widening its circle of usefulness could even the League make such an offer. But with each purchase of this beautiful little lamp goes a "Corresponding Membership" in the League. This costs you nothing and entails no obligations of any kind. It simply means that your name is registered on the League's books as one interested in things of real beauty and art for home decoration, so that as artists who work with the League create new ideas they can be offered to you direct without dependence on dealers.

Send No Money

No matter how many other lamps you have in your house, you will always find a place just suited for this dainty, charming, little "Aurora" 16 inches high, shade 10½ inches in diameter, base and cap cast in solid Medallion, shaft of stainless brass, choice of two color schemes—rich statuary bronze with brass-bound parchment shade of a neutral brown tone, or ivory white with golden yellow shade. Inside of shades is tinted old rose to give a mellow light. Shade holder permits adjustment to any angle; push-button socket, six feet of lamp cord and 2-piece attachment plug.

You will rarely if ever, get such a value again. Send no money—simply sign and mail the coupon, then pay the postman \$3.50 plus the amount of parcel-post stamps on the package. Shipping weight only 5 lbs., no postage even to furthest point is insignificant. If you should not find the lamp all we say of it, or all you expected of it, send it back in five days and your money will be refunded in full. Clip the coupon now, and mail to

Decorative Arts League, 175 Fifth Avenue, New York, N. Y.
Decorative Arts League (175 Fifth Avenue, New York, N. Y.)

You may send me, at the member's special price, an "Aurora" Lamp, and I will pay the postman \$3.50 plus the postage when delivered. If not satisfactory I can return the lamp within five days of receipt and you are to refund my money in full.

You may enter my name as a "Corresponding Member" of the Decorative Arts League, it being distinctly understood that such membership is to cost me nothing, either now or later, and is to entail no obligation of any kind. It simply registers me as one interested in hearing of really artistic new things for home decorations.

Check finish desired—Statuary Bronze or Ivory White

(S.G.)

Signed.....

Address.....

City..... State.....

How do you buy Your Radio Batteries?

DO YOU SAY to a jeweller, "I want a watch!"—or do you ask for a specific watch that does well what watches must do well? And so with batteries for radio.

Most of the noises attributed to static and other causes are *battery* noises. They are caused by irregular current discharge—"fluctuating" voltage.

Have you ever noticed how electric lights *flicker* in some localities—enough to make reading impossible?

Just so, ordinary batteries send out *fluctuating* currents, which make *hearing flicker*!

Radio bats "A" and "B" give absolutely *steady* voltage. They eliminate "interference" because they never produce it. They cut out "static" because they don't produce sounds *like* static.

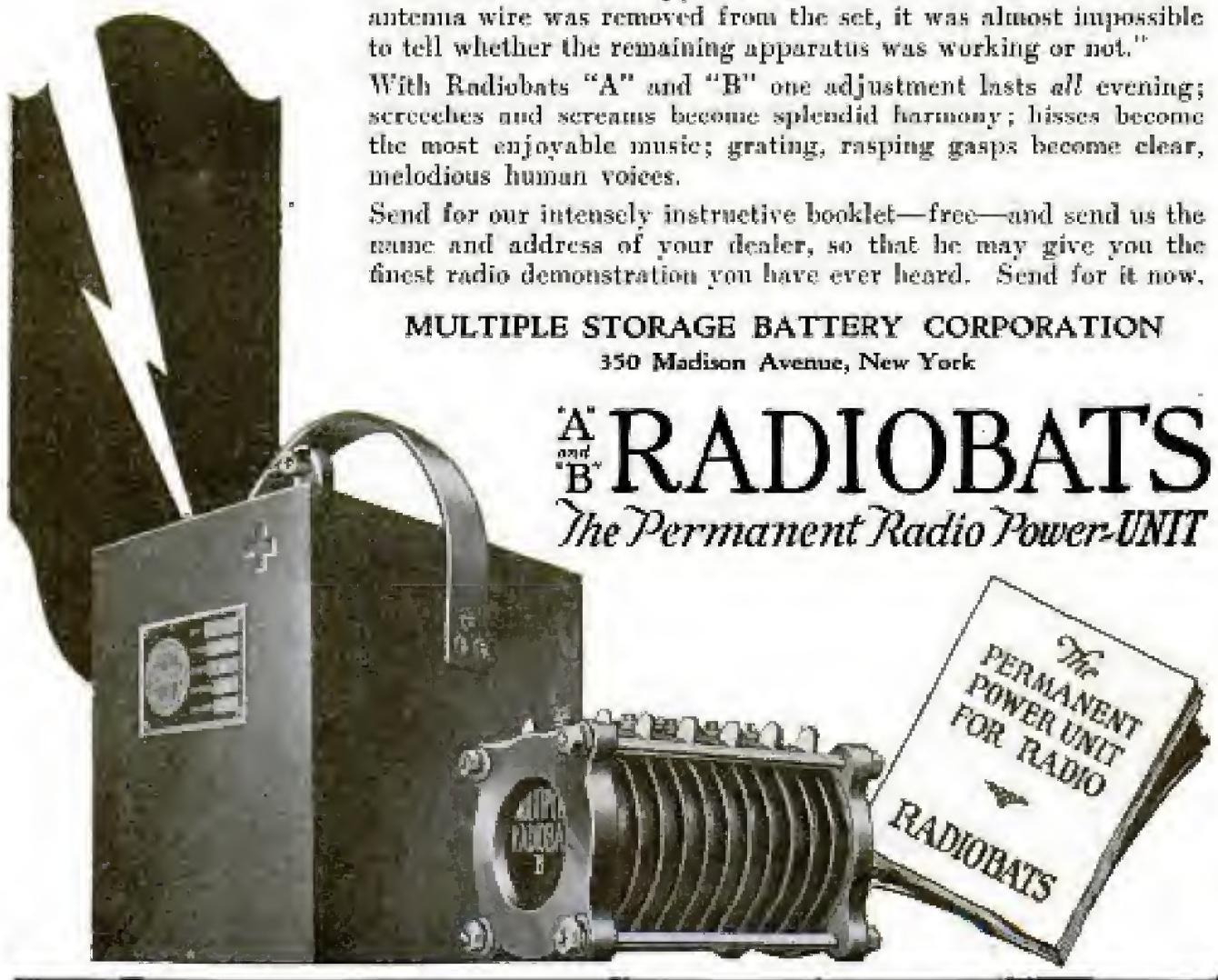
George Gaynor Hyde, one of the foremost consulting engineers in Radio reports, ". . . . total absence of any noises such as are common to the usual type of "B" batteries. In fact when the antenna wire was removed from the set, it was almost impossible to tell whether the remaining apparatus was working or not."

With Radio bats "A" and "B" one adjustment lasts *all* evening; screeches and screams become splendid harmony; hisses become the most enjoyable music; grating, rasping gasps become clear, melodious human voices.

Send for our intensely instructive booklet—free—and send us the name and address of your dealer, so that he may give you the finest radio demonstration you have ever heard. Send for it now.

MULTIPLE STORAGE BATTERY CORPORATION
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and
B
RADIOBATS**
The Permanent Radio Power-UNIT



Popular Mechanics Magazine

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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 38

NOVEMBER, 1922

No. 5

96

New "King of the White Water"

BEFORE an audience of 10,000 persons at Seattle, Wash., recently, famous log rollers from various parts of the United States and Canada met in competition to determine who should have the right to call himself "King of the White Water," champion log burler of the world. A. F. Speigel, Washington lumberjack, former world's champion, went down to defeat before Matt Dillon, woodsman of Hoquiam, Wash., following a spirited battle lasting 43 minutes—the longest contest of its kind on record.

Log-rolling contests originated in the woods of the eastern part of the United

States and Canada. Long before the advent of the steam sawmill, burling contests were held in Maine, Wisconsin, Michigan, and the famed North Woods of Quebec and Ontario. There was hardly a lumbering district that did not have a champion who could "ride the whitest water and cuff a log from day-break to dark." In more recent years log-rolling contests have moved to the Pacific coast along with the main lumber industry.

The recent contest, in which the world's championship changed hands, was held in the Lake Washington Ship Canal.



Matt Dillon, New World's Champion Log Roller, at Left, at the Start of His Record 43-Minute Battle
—the Longest Contest of Its Kind on Record—Which Won Him the Lumberjacks' Coveted Title of "King of the White Water"

L. W. Pedrose
1453 W. 54th Street
Seattle, Wash.

Pike poles and other balancing aids were barred. The log used for the contest was of fir, 13 feet long and 18 inches in diameter, turned on a lathe to assure perfect cylindrical form. Contestants wore bath-

ing suits and caked shoes. The contest was a test of strength, agility, and headwork. A purse of \$200 rewarded the winner, who in addition enjoys the title of champion log roller of the world.

Specs

COLOR AND SHAPE GLASSES TO MATCH HAIRDRESS

Claiming that health and beauty permit neither light lines above the eyes



Above: Eyeglasses Conforming to Lines of Hat and with Upper Portion of Rims Darkened. Left: Eyeglasses of Crescent Design and with Shaded Rims

COURTESY, EYEGLASS CO., HUPFER

nor dark lines below them, and that therefore eyeglasses of a single color are impracticable, an optician has designed glasses with the top rim in dark hues and the lower rim in various light shades. Carrying the idea of beauty a step farther, he has also made the upper rim with different contours to conform to the wearer's eyebrows, hairdress, or hat.

It is estimated that motor-driven vehicles in the United States have a combined power equivalent to more than 300,000,000 horses, while the total number of horses and mules in the country is less than one-tenth that figure.

Specs

CENTRAL-STATION DRILLS TRAIN FIREMEN

The city of San Antonio, Tex., has been getting some highly gratifying results from the intensive training given the city firemen at the central station. This station has special towers for drill in climbing and rescue work. A permanent net is provided to guard against accidents. Members of the various companies have their definite days for this drill work and gain nimbleness in climb-

Specs

DEEP BRAZILIAN MINE NEEDS PRECOOLING OF AIR

Miners working nearly one and a quarter miles below the earth's surface in Brazil, South America, find the temperature of the surrounding rocks to be 118° F. To overcome this impossible working temperature, a system of precooling the air with large fans has been installed. The effectiveness of this system is now being studied by the U. S. Bureau of Mines with a view of adopting a similar practice in some of the deeper mines in this country.

Specs

TEAPOT HEATED BY CHARCOAL COMMON SIGHT IN CHINA

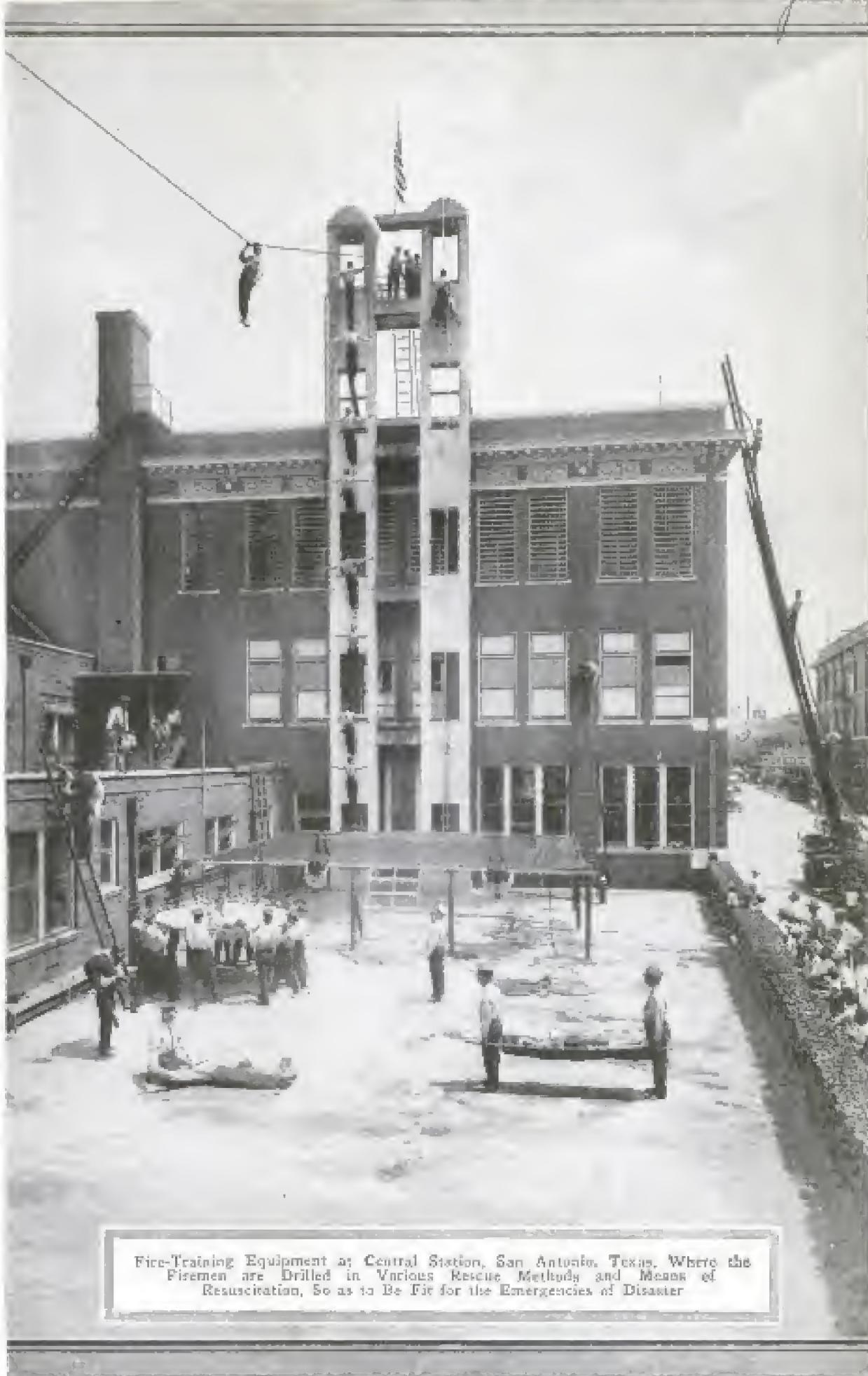
Teapots heated by charcoal are common sights in China, where the affable host invariably serves a cup of tea to the visitor, even at business houses. The curious-looking utensils are "two stories" in height—the upper being for tea and the lower for the charcoal burner—and are made of brass. These articles have been in use in that country for several centuries, and some contend that the elaborately finished percolators used for making coffee and tea in modern homes, are in fact modifications of the ancient Chinese teapot.



Specs
Cont. Roy C. Bennett 1208 N. 57th St.
Philadelphia, Pa.

ing ladders, rescuing supposed fire victims, etc. They are taught the use of the life net and the proper methods to induce respiration, as well as many other pointers that are of practical value to them when they are on actual service. Gymnastic exercises are also a part of the work in keeping the firemen in fit physical condition for the strenuous duties they have to perform in case of fire.

cont George F. Paul,
900 Ellsworth Aldg Chicago



Fire-Training Equipment at Central Station, San Antonio, Texas. Where the Firemen are Drilled in Various Rescue Methods and Means of Resuscitation, So as to Be Fit for the Emergencies of Disaster.

Chicago Evening Post 8/14/22

Local News 8/15/22

PUSH-BUTTON IN LONDON

Fresh-Air Supply Controlled at County Council—No

BY HENRY

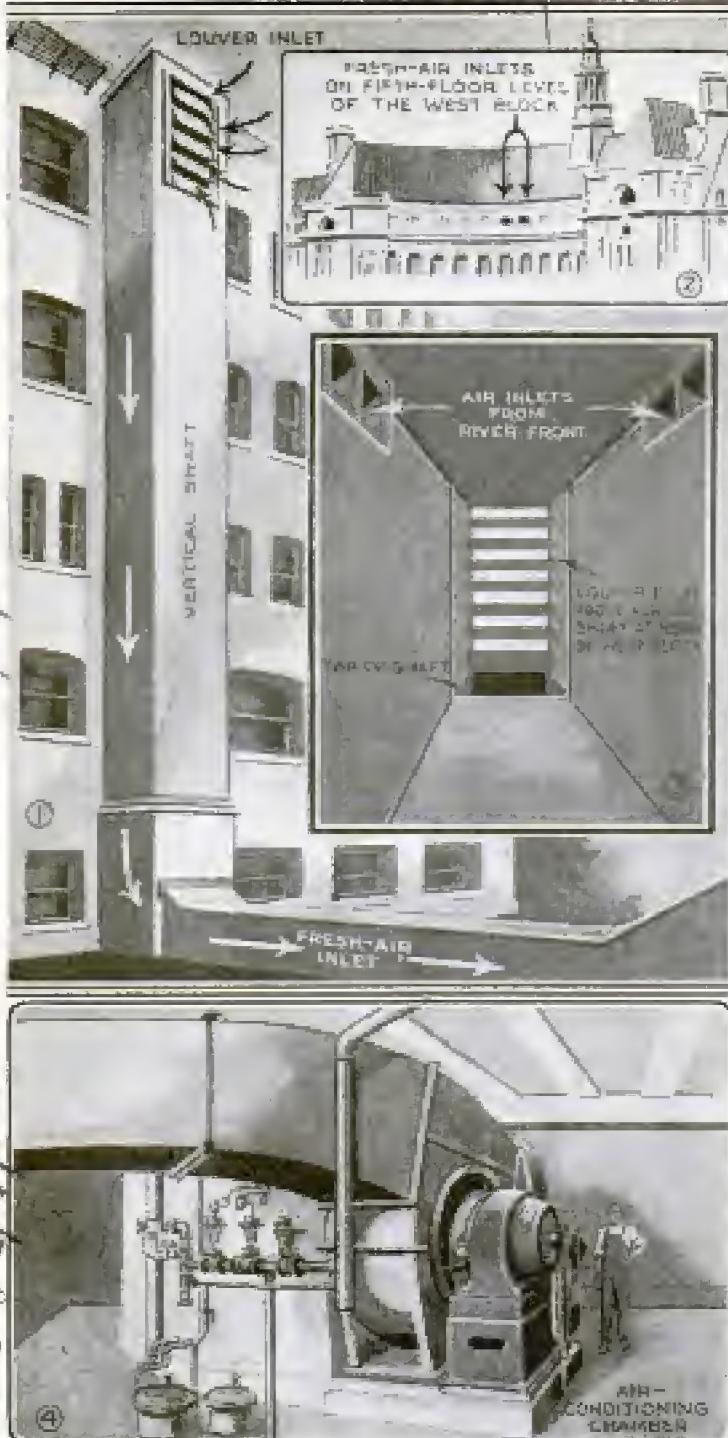
stories above ground, and two stories below it. The latter are used for storage and for the housing of one of the most up-to-date ventilating systems that has ever been installed. The building is situated along one bank of the river Thames and the whole of the site is covered with a concrete raft, five feet thick, surrounded by deep retaining walls.

The most interesting portion of the building is the council chamber, which accommodates 200 members. Octagonal in shape, it is 55 feet high, and is lined with beautifully finished marble and oak paneling, in the same style as the committee rooms, lobbies, and main staircase.

Very elaborate means have been furnished for the heating and ventilation of the whole of the building, but especially with regard to the council chamber, which is supplied with filtered air, conditioned at a constant temperature of 65 degrees by means of apparatus controlled by thermostats. Louver air inlets are located at the roof level of the front and rear walls of the council chamber, and after passing down glazed brick shafts, the air enters the conditioning chamber below the ground level through inlets controlled by dampers. Thence the air passes to the humidifier where it is thoroughly cleansed and saturated. Automatically controlled batteries warm the air in winter to a constant temperature of 65 degrees. In hot weather the air is cooled by blocks of ice which are melted

rapidly by spraying them with water. After being conditioned the air is propelled by electric fans through mains to a maze of distributing pipes below the chamber floor. That it is indeed a maze is caused by the fact that an air-supply pipe leads to every one of the 200 members' seats.

Here becomes apparent the most striking novelty of the whole ventilating system. At each seat is a desk, at the back of which is an outlet register pointed up-



View 1 Shows One of the Glazed-Brick Shafts on the Rear Wall of the Council Chamber; 2, the Air Inlet on the Front Wall of the Chamber, and 3, Air Corridor Connecting Front and Rear Inlets. View 4 Shows Large Fan in the Conditioning Chamber

ONE of the largest structures in London, England, is the new County Hall that was formally opened on July 17, 1922, although the cornerstone of the building had been laid as long as 10 years previously. That so long a time was required to complete the building was the result of delays caused by the war.

This new home for the London County Council, and its rapidly growing staff, is 750 feet long, with an average width of more than 300 feet, and comprises seven

VENTILATION BUILDING

Seats by Members of London
Conflicting Air Currents

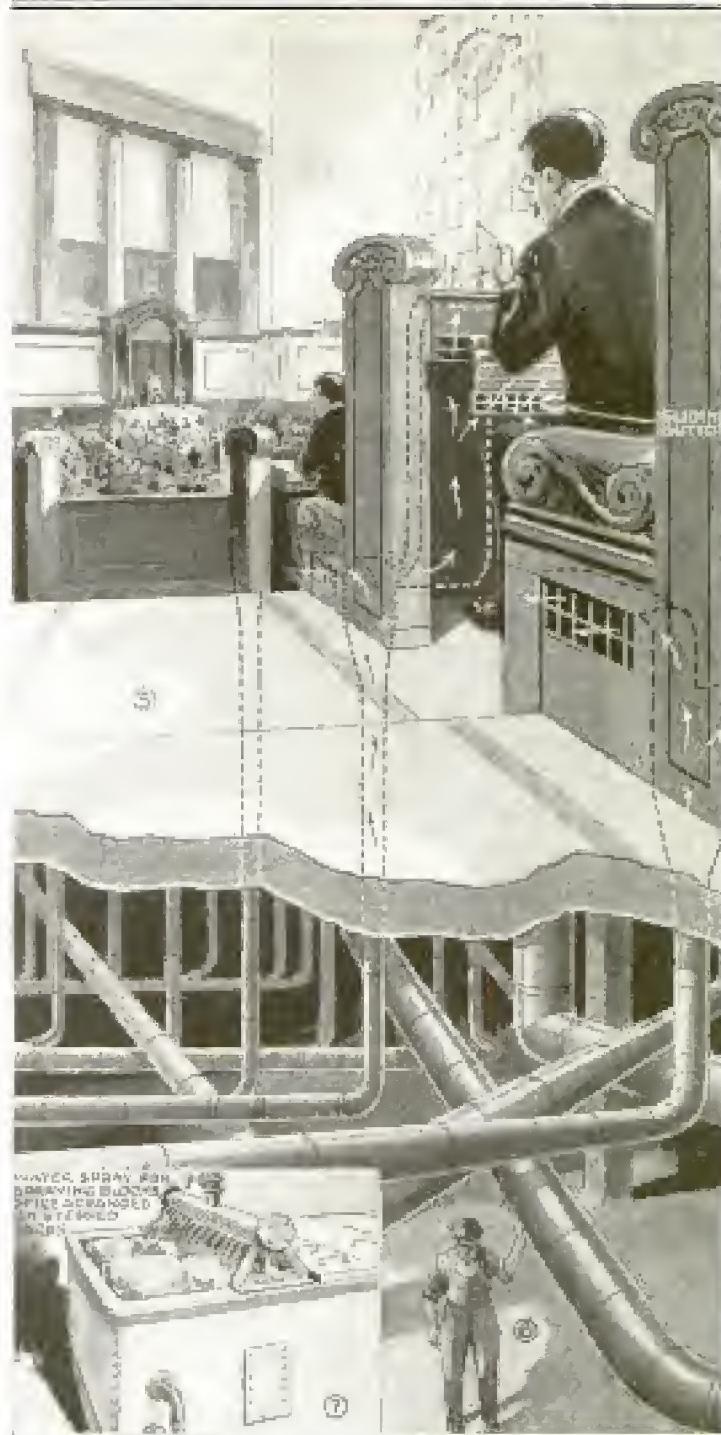
S. WHITE

ward, and another register below the desk pointed horizontally in such a manner that air issuing from it strikes the occupant of the seat like the breeze from a fan. On the horizontal register is a sliding button that controls a valve in such a manner that the occupant of the seat can switch the air either to the vertical register that carries it upward without affecting him individually, or to the horizontal one that directs the air to himself without affecting his neighbor. Additional fans remove the vitiated air from the floor level, and from the roof of the chamber.

Some idea of the capacity of this ventilating system may be gathered from the fact that, without creating any appreciable draft, the air is replaced in the chamber at the rate of over 1,000,000 cubic feet an hour.

In ordinary English summer weather, the refrigeration by means of melting ice, mentioned above, can be dispensed with. Instead, by the evaporation of some 20 or 30 gallons of water an hour, the temperature inside the chamber can be kept at from 10 to 20 degrees below the outdoor shade reading.

In every respect the work on the building has been carried out in accordance with the highest standards of material and workmanship. The total area of the site is about 6½ acres, and including reclamation work, the total cost of the building will be nearly 20,000,000 dollars.



COURTESY, ILLUSTRATED LONDON NEWS

View 5 Shows the Registers at Each Seat, and Button on Desk Register with Which Air is Directed Either Vertically or toward the Occupant of the Seat; 6, the Mass of Pipes under the Chamber Floor, and 7, Part of the Ice Tank for Cooling the Air

MAKING CROSS-COUNTRY TRIP 328 ON ROLLER SKATES

Trying for a record in long-distance skating, an American married couple are roller-skating from Philadelphia to the Pacific coast, with the intention of also making a return trip regardless of road conditions and other obstacles. The skaters, who are now in the West, manage to make expenses by doing trick and

fancy skating at local theaters. They sleep outdoors in camp sacks when the weather permits. To make a perfect record, both refuse to accept offers of "lifts" from automobilists.

The United States uses yearly 2,000,000 tons of newsprint which, if cut into a ribbon of the width of the average daily newspaper, would have a total length of 40,000,000 miles.

Cont. Henry H. Abraham

8536

Second Ave., Twin Falls, Idaho.

C. H. Thomas, Kennett Square, Pa.
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PRIVATE RADIO STATION WELL EQUIPPED

204

BY H. A. LANE

New York

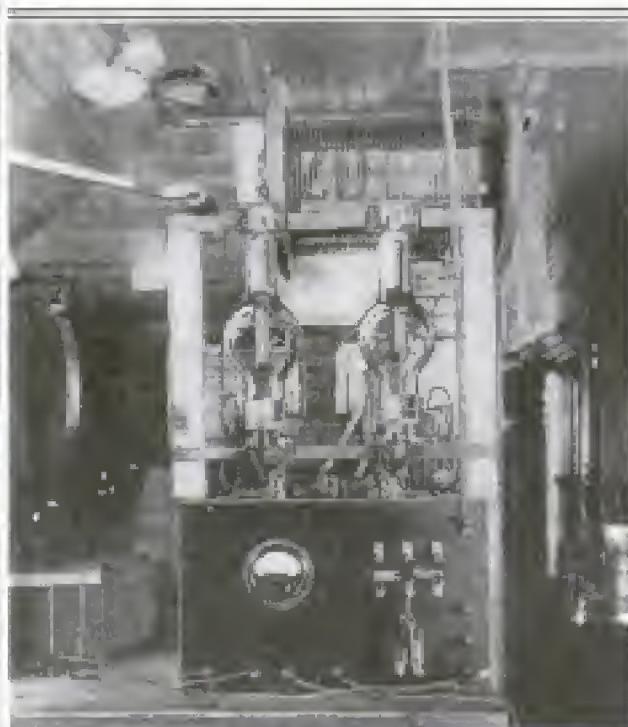
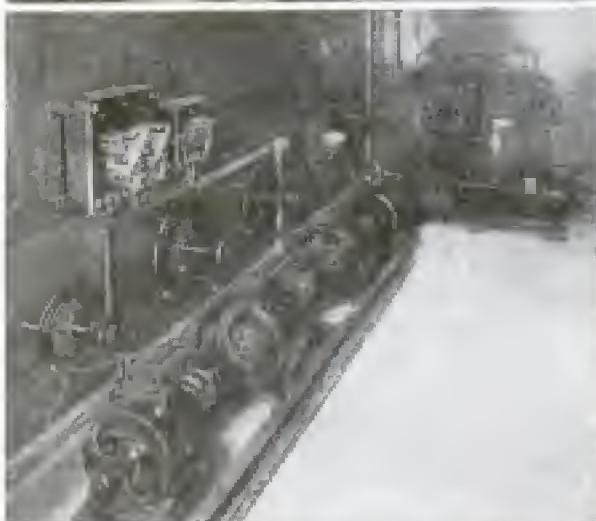
ELABORATE equipment is contained in a private radio station at Parkes-

burg, Pa., which has three licenses, "3 Z O," "3 X W," and "3 O I," these covering any combination of wave lengths not reserved by the navy. A number of transmitters, including a spark set of 325 meters, a radiophone set with a wave length of 3,660 meters, an open-arc set operating on 2,500 meters, and a 50-watt vacuum-tube, self-rectifying set working on 360 meters, are installed in this station. Four generators of 100, 600, 1,000, and 4,000 volts, furnish the direct current for the outfit, the receiving apparatus of which is inclosed in zinc-lined rooms, while the cabinets and lamp closets are constructed of the best bakelite.

The antenna is erected 185 feet in the air and is 350 feet in length, messages and music being received from New Mexico, Maine, and the coast of Wales, which are relayed to other smaller stations or broadcast through a gigantic megaphone for a distance of seven miles. In connection with



Mobile Wireless Station Which Contains a Complete Equipment for Transmitting and Receiving Radio Messages or Music



Upper Left: A Corner of the Elaborately Equipped Radio Station at Parkesburg, Pennsylvania, Showing Some of the Many Cabinets and Storage Batteries. Lower Left: Generator Room with the Direct-Current Machines and Controlling Rheostats. Right: Two of the Huge Amplifier Bulbs and Accompanying Apparatus

this station, a complete broadcasting and receiving set has been mounted on a motor-truck chassis and is inclosed in a miniature house which has windows in the sides, a door at the rear, and is

70

HONDURAS NOW BUILDING MOTOR HIGHWAYS

It is announced that a new motor highway across Honduras, from the Atlantic to the Pacific, will be completed within the next three months. Work is also in progress on several other roads for motor traffic on the Atlantic coast and in the interior. There are no railways except along the Atlantic seaboard, and traffic in the country is now changing from antiquated oxcarts to motor trucks and automobiles.

The Enamel 8/1/22
BLISTERED PAINT REMOVED
156 BY COMPRESSED AIR

Removing old or blistered paint with the aid of an air blast, instead of by the usual gasoline-torch burning method, is possible with an appliance which can be attached to any compressed-air outfit. A special scraper, having an air slot about 2 inches above its cutting edge, is inserted under the loose scales of the old paint, whereupon the powerful blast literally blows them off. As this procedure leaves a smooth surface, more efficient workmanship is assured, since the fresh coat of paint can be applied evenly.



Blistered-Paint Remover Which is Operated by Means of Compressed Air, Showing the Special Scraper Attached to the Air Hose

equipped with adjustable aerial masts. The mobile equipment tours the suburban districts in an effort to arouse the people to a greater interest in the wonders of radio.

26 EAR-CORN CLEANER REMOVES
SHUCKS AND SILK

Ear corn may be efficiently cleaned of shucks and silk by an appliance that has six long toothed rollers which are driven,



**Ear-Corn Cleaner That Removes the Shucks and
Stalks. Showing the Endless Conveyor and the
Rollers Which are Fitted with Teeth.**

by the same mechanism that operates an endless conveyor. As the conveyor carries the corn over the revolving rollers, the teeth of these tear the shucks and silk from the ears, while any loose grains fall between the rollers onto a screen, from which they can be sacked.

264
"RECREATION ENGINEER" ADDED
TO FOREST SERVICE

"RECREATION ENGINEER" ADDED TO FOREST SERVICE

"Recreation engineer" is the title given to a new official working under the direction of the U. S. Forest Service, for the development of public camp grounds and summer-home sites in the national forests of the West. It is estimated that 5,500,000 tourists visit the national reservations yearly.

Engineering News-Record
Copy 8/17/11 material

Designed by -
Weller & Ruppel

Electrical World

8/12/22

661 140 & Popular MECHANICS

109 BALCONY AND FIRE ESCAPE
ATTRACTIVELY COMBINED

A balcony and first-story gravity-type fire escape are attractively combined in a new design which conceals the fire escape



Ornamental Balcony Which has been Designed to Conceal a Gravity-Type Fire Escape, Showing a Man About to Descend.



Here the Fire Escape is Shown Lowered by the Weight in the Front End, and a Man is Seen Descending It.

when not in use. This type is not new, but contrary to the usual escape of this kind the weights are concealed in the front edge of the balcony, while steel sheeting is bolted under the steps, to match the decorated undersheeting of the rest of the balcony. There is nothing to be seen from the street which would lead one to believe that this attractive balcony also had a fire escape.

279 LOW-MELTING-POINT ALLOY
FOR DIAMOND SETTING

A manufacturer of diamond-pointed tools used for cutting for many industrial purposes, has developed an alloy metal that melts at about 300° F., cools quickly, and becomes as hard as steel. This low degree of heat cannot harm the diamond, which is held firmly as the alloy contracts in cooling. The superiority over setting diamonds in steel which melts at about 3,500° F., with the danger of injury to the diamond and the tendency to form blowholes, is apparent.

98 FATAL ELECTRICAL SHOCK
FROM PECULIAR CAUSE-

Standing with her bare feet on a wet floor, a scrubwoman touched the glass bulb of an ordinary electric lamp and was instantly killed. Doctors stated that death was caused by electrocution. Horrified by the unusual occurrence, her employers called in an electrical expert to make a thorough examination. Upon closely scrutinizing the lamp bulb, the investigator discovered a thin streak of lime on the glass, extending from the base of the lamp to within a few inches of the tip. Voltmeter tests plainly indicated a heavy leakage of current through the lime. Further experiments illustrated the danger in conductive deposits upon the surfaces of electric lamps, when extending from the "live" base, this hazard increasing in proportion to the humidity of the surrounding atmosphere and the effectiveness of the contact made with the "ground," or floor, which would complete the circuit through the body.

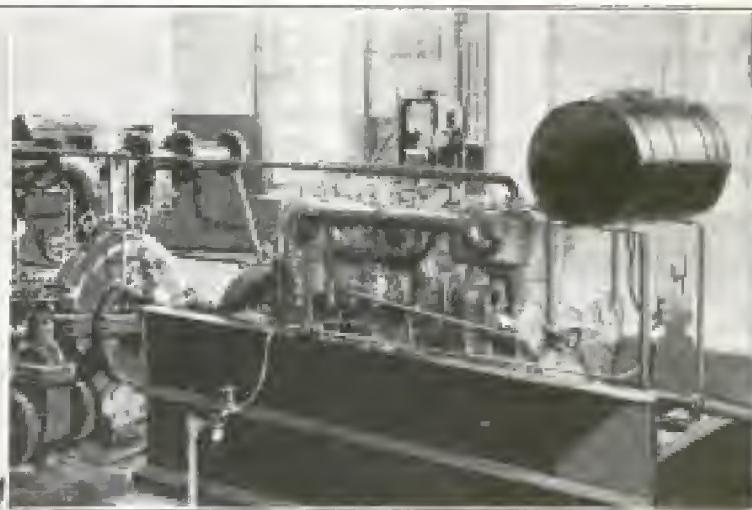
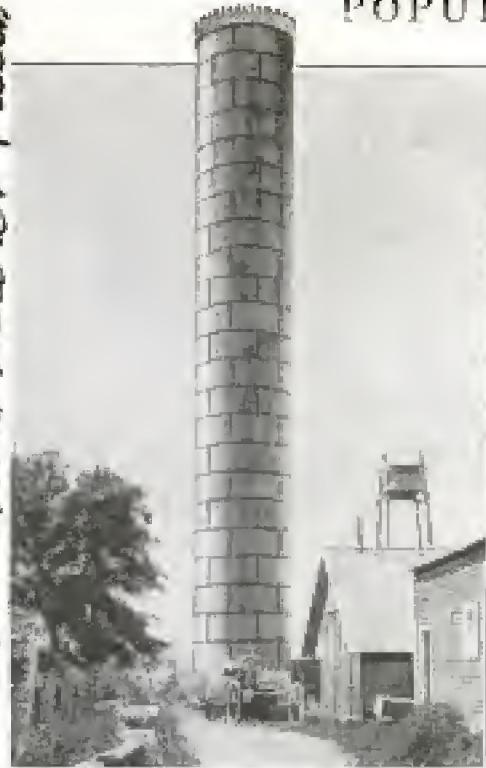
FLASHLIGHT RAZOR PERMITS
SHAVING IN THE DARK

A new combination of flashlight and safety razor will enable all those who are in the habit of shaving themselves to shave when the lights are out, or to shave with more comfort where the light is poor. The handle of the razor is a flashlight and throws a brilliant glow on the face.



Mfr. W. J. Lessore, Printing Craps, 83 to 34th St., Eighth Ave., New York City

Harry A. Offenbach 65 Hudson
St., New York City, N.Y.



Above: Installation of an Automobile Engine Connected to Pump in the Water-Supply Station of an Eastern Village, Which is Saving Money for the Taxpayers with This Unusual Drive. Left: The 75-Foot Standpipe Which Accumulates the Excess Water Pumped, and Serves as a Reservoir When the Pumps Are Idle

VILLAGE WATER-SUPPLY PLANT RUN BY AUTOMOBILE ENGINE

An eastern village has adapted a well-known automobile engine to the operation of its water-supply system. The engine is direct-connected to a centrifugal pump which takes the water from the filter reservoir, and forces it some distance into a standpipe located on a hill. The motor, which will develop 120 horsepower, normally operates at 70 horsepower in pumping about 1,200 gallons per minute. This gasoline engine has replaced a steam-driven unit at considerable

saving to the taxpayers, and is said to represent a more economical installation than electric-motor-driven pumps.

FIRST AMERICAN-CONSTRUCTED SIX-PASSENGER BIPLANE

The first six-passenger cabin biplane built in America was only recently completed. It is equipped with the latest type 12-cylinder Liberty motor which can be started by cranking from within the cabin, and will attain a speed of 100 to 125 miles per hour. The plane has a wing spread of 43 feet 7 inches, measures



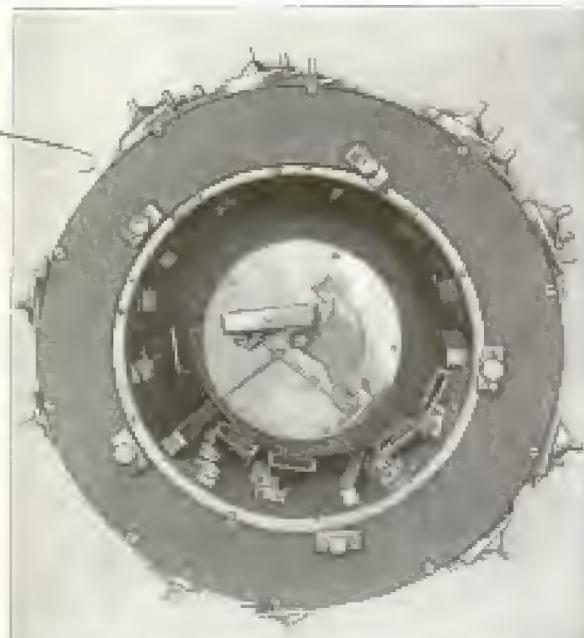
This First Six-Passenger Cabin Biplane Built in America Is of Interest Because of Its Equipment and Its Possible Adoption for Commercial Use on a Proposed Air Route

Designed by: Mrs. L. Porter
+ G. G. Woodson, Wabash, Ind.
Copyrighted material

29 feet from propeller to tail, and weighs 3,500 pounds without load. It is equipped for wireless communication, and the cabin, with side-door entrance, is designed for the comfort of the passengers and for protection from the wind and elements.

MULTIPLE MANOMETER RECORDS AIRPLANE PRESSURES

16 A multiple manometer specially designed to record the air pressures at 30



Langley Memorial Aeromachical Laboratory

Top View of Multiple Recorder, with Film Drum Removed, for Measuring Air Pressures on the Surfaces of an Airplane

different points on an airplane in 30 seconds has recently been developed by the National Advisory Committee of Aerodynamics. Its particular application is in measuring the magnitude and distribution of pressures over the horizontal tail surfaces of a machine in flight, regarding which there have heretofore been no real data.

Realizing that the instrument should be free from long connecting tubes, and that the individual manometers should have a high period of vibration as well as be independent of acceleration and vibrations in the airplane, the designers arranged the manometers in three rows around the outside of a cylindrical aluminum casting. Each manometer consists of a small brass case divided into two sections by a brass diaphragm, with a pressure connection to either side. Movement of the diaphragm rotates a tiny mirror delicately mounted. At the bottom of the cylinder an electric bulb throws a horizontal beam of light through a fine slit, which light is reflected by 10 prisms on the inside of the cylinder, up to 30 small prisms which throw it against the mirrors, and these in turn reflect the light upon a photographic film placed upon a drum in the center of the cylinder. A rotating shutter causes the light to reach each of the 30 mirrors in succession, as the film drum is moved into correct position by a tenth of a revolution after each exposure.



Outside View of Multiple Manometer: Note the Three Rows of Manometers Arranged around the Outside of the Aluminum Cylinder

“ONE-NIGHT STANDS” PLAYED BY PORTABLE THEATER

16 “One-night stands,” on a “circuit” composed of the different playgrounds of the city, are the “bookings” obtained for a portable theater in Elmira, N. Y. The miniature playhouse, designed for community service, has, when closed, an outward appearance of a small house on wheels, with doors at either end. One side of the structure can be lowered by a lever arrangement, to provide a stage 16 feet wide by 15 feet deep, around which

a curtain may be stretched and which easily accommodates a cast of 15 to 25 persons. The outfit, which can be efficiently handled by one man, is fully equipped with footlights, border lights, motion-picture screen, piano, and other necessities of the theater. Since the introduction of the innovation, thousands of spectators have crowded the parks nightly, to witness the performance of plays by children.

160 Planned by J. Herbst, Organized
+ Executive Secretary, Elmira
POPULAR MECHANICS
Community d' service

667



Built by Elmira Community Corporation
Elmira, N.Y.

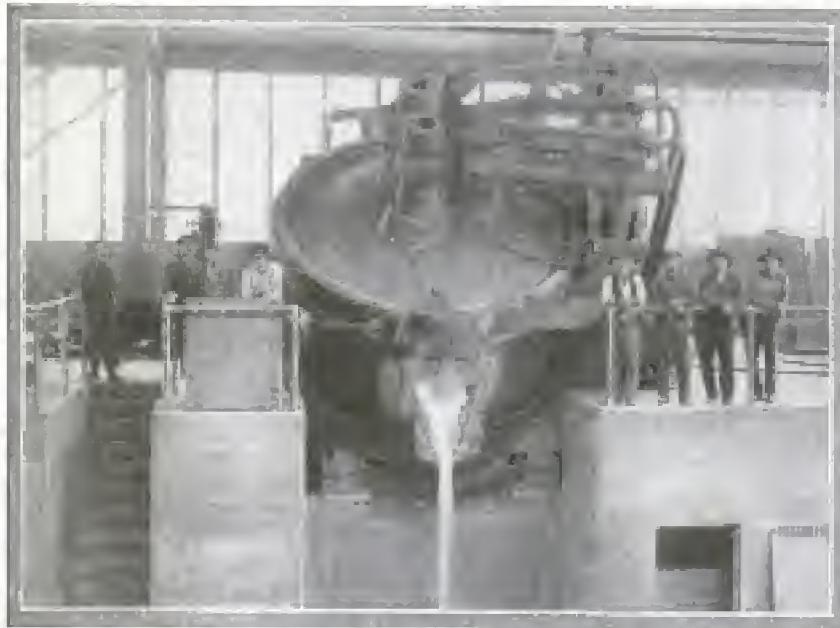
International Nickel Co. Huntington W. Va.

668

137

COPPER PIPES AS CONDUCTORS FOR ELECTRIC FURNACES

An improvement in electric-furnace practice, for the making of refined steel



A Seven-Ton Electric Furnace, of the Heroult Type, Shown Tilted to the Pouring Position. This Furnace is Fitted with Copper-Pipe Conductors and is Used for Refining Monel Metal.

and alloy metals, is the substitution of copper pipes for the ordinary type of solid or built-up copper busbars used to conduct the electric current to the electrodes of the furnace. At a plant where this has been done, the construction has not only been simplified, but there has been an increase in efficiency of the Heroult type of furnace used for melting and refining monel metal. The hollow circular section has an electrical advantage in conducting alternating current, and, in addition, the pipes are used to circulate water to cool the electrode holders. The cooling effect on the copper conductors is especially important where they have to be carried over a hot furnace, and in this case only one-third as much copper was required as when using busbars of older types.

KIDDIES PLAY ALL DAY IN REAL TROLLEY CARS

"Play as You Enter" is the welcome sign on the sides of the "Jollytown" trol-

has set aside several cars for the children to play in. The cars are complete in

every detail except that the power is turned off and they are anchored to the ground, to prevent the more venturesome kiddies from attempting to explore the busy down-town districts in them. Instead of the usual advertising cards, Mother Goose rhymes and animal pictures are displayed along the sides, to provide instruction as well as entertainment for the youngsters. The constant din of register bells clanging gongs, starting and stopping signals, and the loud calling of imaginary and unheard-of street names, afford a noisy proof to the amused passers-by of the extreme popularity



One of the Extremely Popular "Play Cars" Which have been Set Aside for the Kiddies to Play In. Showing the Welcome Signs and the Completeness in Detail of the Cars, Even to the Trolley

trolley cars in Baltimore, near one of the city parks, where the traction company

of the "play cars" as the crews take them along fancied routes.

Owned by
United
Railways
and
Electric
Co.,
Baltimore,
Md.



A View of Norway House, a Famous Trading Post of the Hudson's Bay Company in the Early Days of the Canadian Northwest, as It Appears Today after being Converted into an Airplane-Service Station by the Dominion Government

FAMOUS TRADING POST NOW AIRPLANE STATION

The advance of civilization in the wilds of Canada is strikingly shown by the establishment of an official air-service station at Norway House, one of the famous posts of the Hudson's Bay Company at the northernmost tip of Lake Winnipeg. The forest-patrol work that is being done from this station is of the greatest value in protecting millions of dollars' worth of the choicest timber from fire. The old trading post has taken on new life and importance since the coming of the bird-men.

Norway House was for over 100 years one of the great transfer points of the Hudson's Bay Company. It is situated on the shore of Playgreen Lake, a body of water formed by the expansion of the Nelson River just after it has left Lake Winnipeg on its way to Hudson Bay. It is roughly in the center of a large triangle, of which the angles are York Factory on Hudson Bay, Winnipeg (Fort Garry), and Edmonton. It is, in round figures, 500 miles from Hudson Bay, 300 miles from Fort Garry, and 550 miles from Edmonton. From Norway House the Nelson and Hayes rivers run northeasterly to Hudson Bay, the great Saskatchewan River gives access across the northern

line of prairies to the foothills of the Rocky Mountains, and Lake Winnipeg and the Red River make a highway to Fort Garry and the Pembina country.

The old post was thus at the main crossroads of the whole of middle Canada, and the wealth and commerce of this wonderful region passed annually through its gates. In the days when the goods for the Hudson's Bay Company's trade came in through York Factory, at the mouth of the Nelson River, it was not the custom to send the fleets of York boats (big freight skiffs, 40 feet long) from York Factory clear through to Edmonton. Instead, the vessels from the sea went as far as Norway House, where they met the fleets from Edmonton and Fort Garry. The traders from the South and West turned over their bales of furs to the men from the seacoast and returned to the Saskatchewan and Assiniboine trading posts with manufactured goods from Great Britain.

At such times all trails seemed to lead to Norway House, and now, when the big planes are skimming over the unbroken leagues of dark forests, their pilots are always eager for a glimpse of the familiar outlines of the old fort buildings.

Hudson Bay Company
Lake Winnipeg, Canada

Littell McClung, Florence, Ala.

WILSON DAM

World's Largest River Barrier Is Main Engineering Feature
of 1,000,000-Horsepower Muscle Shoals Power
Project on the Tennessee River

154

BY R. C. FOLGER

HERE has recently been considerable agitation to resume construction of the Wilson Dam, across the lower reaches of Muscle Shoals of the Tennessee River in Alabama, and it is felt in many quarters that, unless Congress accepts one of the offers now pending, the work should continue with government forces or under its supervision, until final disposition is made of the properties.

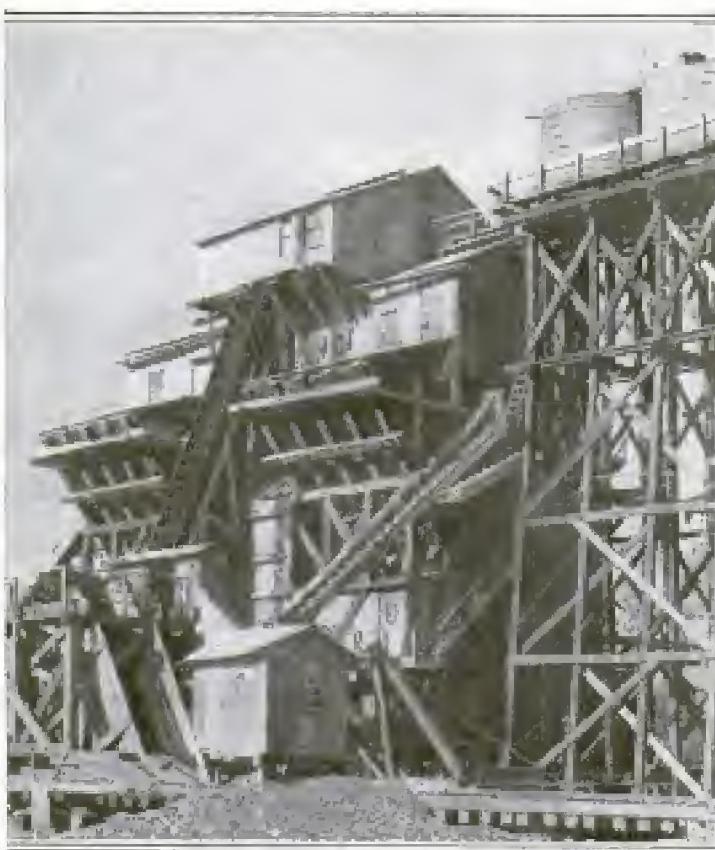
When completed, Wilson Dam will represent the largest river barrier ever built, making possible the world's greatest power-generating plant at an estimated total cost of over \$40,000,000. With 1,200,000 cubic yards of masonry, the dam will be nearly three times the size of Roosevelt Dam in Arizona, twice as large as the Keokuk Dam across the Mississippi, and will exceed the world-famed Assuan Dam in Egypt by almost 100,000 cubic yards.

Slightly more than 100 feet wide at the base, it will rise to a height of 100 feet, and will be 4,500 feet long. The water impounded by the dam will form a pond 1 to 3 miles wide and 15 miles long, submerging the much-talked-about Muscle Shoals, and will necessitate the clearing of 10,000 acres of timber land. There will be two electrically operated lock chambers at the north end of the dam, each having a lift of slightly more than 45 feet. The power house, forming an integral part of the south end of the dam, will be 1,184 feet long and house 18 gen-

erating units with a total capacity of 625,000 horsepower, which will require a high dam at the headwaters of the river in eastern Tennessee, to create an immense storage reservoir from which to regulate the flow of water through the river. Plans for the complete development of the power possibilities, providing for another dam at a site 15 miles above the Wilson Dam, will add 250,000 horsepower, and

other smaller dams still farther upstream will bring the total up to 1,000,000 horsepower. A 25,000-horsepower steam plant supplies power for all the construction machinery, and will later serve as an auxiliary to the water-power stations.

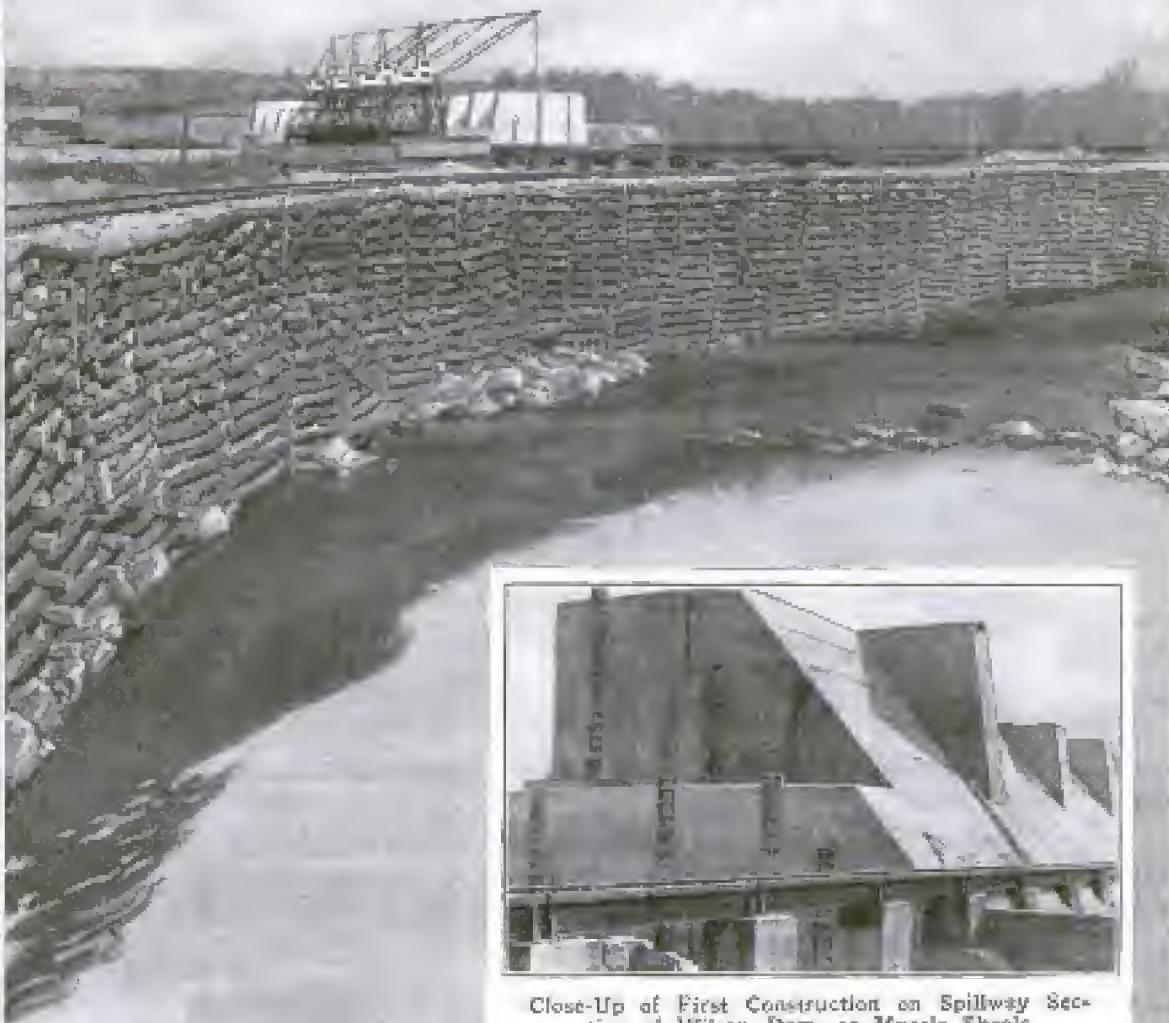
An interesting feature of the plans is the beautiful concrete bridge, spanning the entire length of the dam, that will mark the intersection of the Robert E. Lee and Jackson highways, and form a connecting link in



This Large Crushing and Screening Plant, for the Preparation of Stone Aggregate Used in Concrete for the Wilson Dam, Is Conveniently Located on an Island in the Middle of the Tennessee River

both of these great transcontinental roads. The economic significance of the project lies not only in the abundance of cheap power it will afford, but in its situation in the midst of one of the richest ore belts in the world, which will permit the manufactured products from the iron ores of Alabama and Tennessee, the phosphate and dolomite deposits of Tennessee, and the potash shales of Georgia to be transported over one of the longest inland watercourses in the world.

Begun during the late war for the purpose of supplying nitrates used in the



Close-Up of First Construction on Spillway Section of Wilson Dam, at Muscle Shoals Power Development

Building Spillway Section of Wilson Dam, across Jackson Island in the Middle of the Tennessee River



Bluffs on South Bank: Arrow Indicates Where the Lee and Jackson Highways will Cross Dam



View Showing the 12-Acre Cofferdam, the Concrete and Limestone Foundation of the Power House, and, in the Foreground, One of the Water-Turbine Foundations for the Muscle Shoals Power Project

manufacture of high explosives, this enormous enterprise will be available for the future service of the country in time

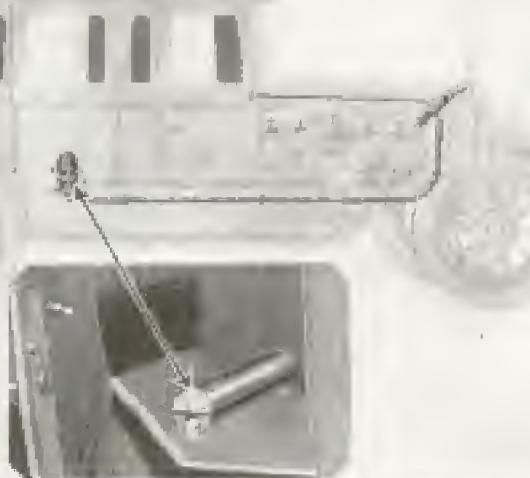
of necessity, and its strategic inland location greatly enhances its value from the standpoint of national defense.

Anti-Gas MOTOR CARS NOW HEATED BY HOT WATER

Heating the interiors of motor cars with hot-water radiators connected in the

circulating system of the engine, is the principle of a lately developed arrangement. The heaters are made in seamless-steel cylinder-footrail types, or in rectangular shapes, which are placed flush with the floor in any part of the car. An intake valve, which may be controlled from the dashboard, regulates the flow of water to the heater and consequently its temperature. The innovation can be easily installed in any machine; there is no operating cost, merely an extra gallon and a half of water being required in the circulating system, and no odor of any kind is possible, as is not infrequently the case with heaters that make use of the hot exhaust gases from the engine.

American Water Heater Corp.
169 W. 2d St., Chicago
2838 W. 2d St., Chicago



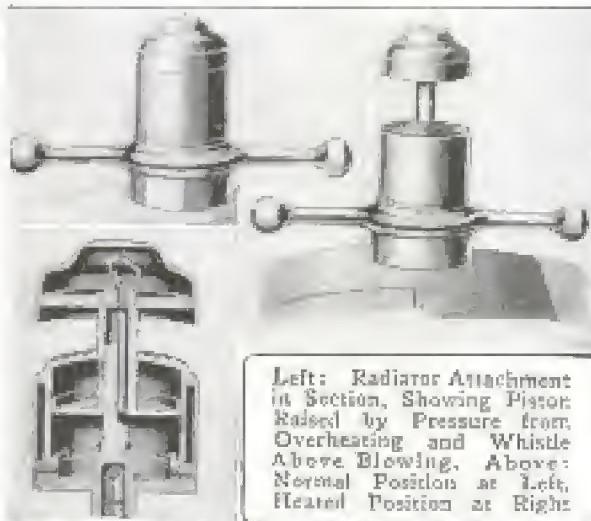
At the Top Is a Phantom View of a Motor Car with the Hot-Water Heater System Installed, While at the Bottom a Close-Up of the Radiator is Seen

COLLEGE NEAR ARCTIC CIRCLE
OPENED BY ALASKA

Seventy miles from the Arctic circle, at Fairbanks, Alaska, has been opened a college with courses in mining, agriculture, home economics, civil and electrical engineering, general science, and commercial work. The college, probably the farthest north of any in the world, was founded with an appropriation of \$60,000 from the territorial legislature, while the Federal government will aid in supporting the institution by an annual subvention of \$50,000. About 100 students are registered.

RADIATOR ATTACHMENT BLOWS WHISTLE WHEN OVERHEATED

A new automobile-radiator attachment helps to keep the water cool, and also acts as an alarm when the water becomes overheated. Attached to the radiator cap, a small closed cylinder, with a hollow wall that acts as a cooling chamber, contains a flat piston that is raised by the air pressure resulting from the overheated water. The top of the small cylinder is



convex and bright red in color. Normally, this is covered by a cap connected to the piston rod which passes through the top of the cylinder. On top of the piston rod and under the cap is a whistle. As the pressure enters the cylinder through ports below the piston, this is raised high enough to expose the red danger signal; then as the pressure increases, the whistle is blown, and finally, when the water actually boils, the piston is raised high enough to allow the steam to escape through a port located in the hollow piston rod.

HANDY DEVICE FOR TURNING LEAVES OF SHEET MUSIC

For turning the leaves of sheet music quickly when on the stand, a device has been placed on the market in England.



Device for Turning Over the Leaves of Sheet Music on a Piano or Other Music Stand: It is Operated with the Fingers and Thumb in the Manner Shown

that is somewhat similar to several in this country, though said to be exceptionally simple. This leaf turner is operated by pressure of the fingers of one hand aided by holding the thumb against a small lug by the side of the lever.

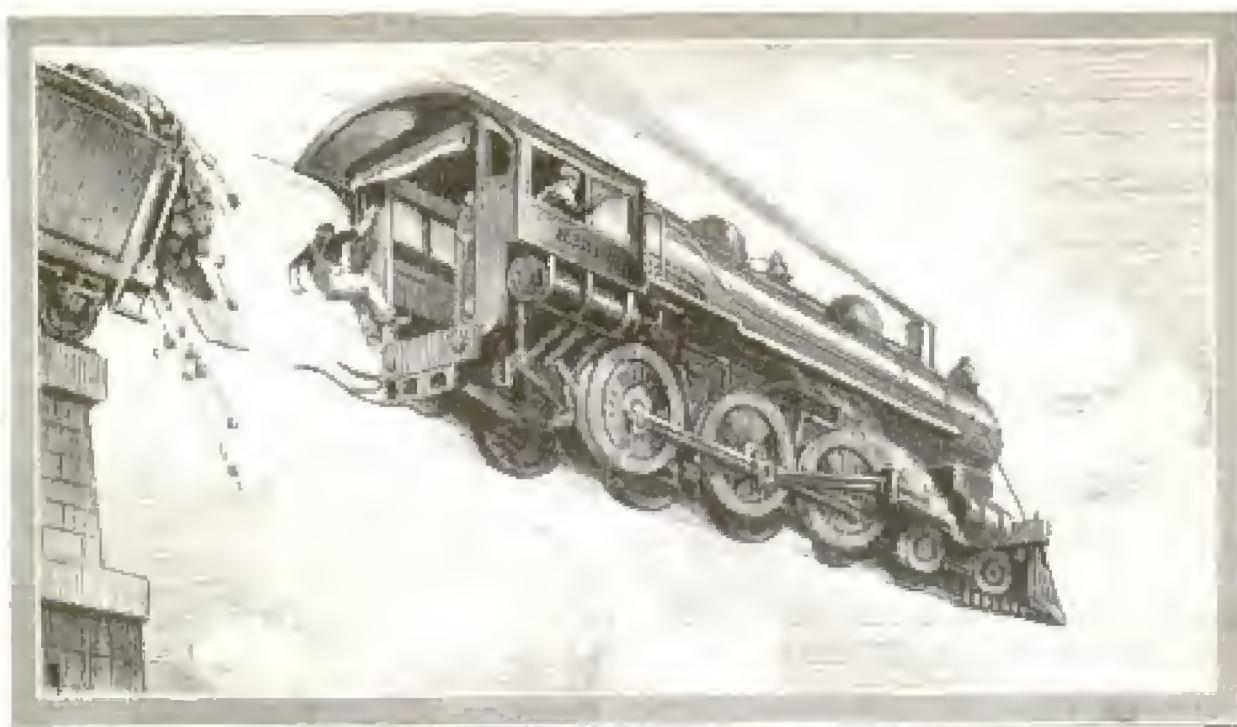
RUBBER AND FRICTION TAPE COMBINED IN ONE ROLL

Electrical workers, when wrapping a newly made joint, can apply both rubber and friction tape from the same roll and at the same time, if a recently introduced insulating tape is used. The product comes in the usual half-pound rolls, $\frac{3}{4}$ inch in width, averages approximately 85 feet to the pound, and is covered with tinfoil. Advantages of the use of the article are, that the workman saves time by applying both kinds of tape at one operation, plenty of insulating rubber is assured on every joint, and only one kind of tape need be carried in stock.



Combination Roll of Rubber and Friction Tape Which Enables Electrical Workers to Apply Both at Once

ton rod.
Alert Alarm Co.
609 N. La Salle
Chicago.



974 HOW FAR CAN A LOCOMOTIVE JUMP ?

BY FRANCIS W. WILSON

LOOK over a locomotive as it stands pushing in a train shed, and you regard its impressive bulk with a certain degree of awe. You cannot imagine this huge steel monster jumping at all. You would say that it couldn't jump. Imagine its solid supporting track removed, and you would predict that gravity would claim its own, regardless of the speed at which it might be traveling.

Stand close to the track as the same locomotive rushes past at 60 miles an hour, and you get another, and quite different impression—that of irresistible force, propelled at a speed which would hurl it across a sheer open space like a shell fired from a powerful gun. And then you change your opinion. Yes, you conclude, that, vast though its weight and clumsy its proportions, it might leap across a measurable span with rather a flat trajectory.

Your last impression is correct. A mathematician could tell you with reasonable accuracy just what might be expected if a locomotive of known weight, traveling at a given speed, arrived at a trackless open space. But more impressive are the known performances.

The bridge engineer of a certain railway showed me, some years ago, a photograph of a locomotive taken just after it had leaped across a 28-foot opening. The big drivewheels rested securely on the

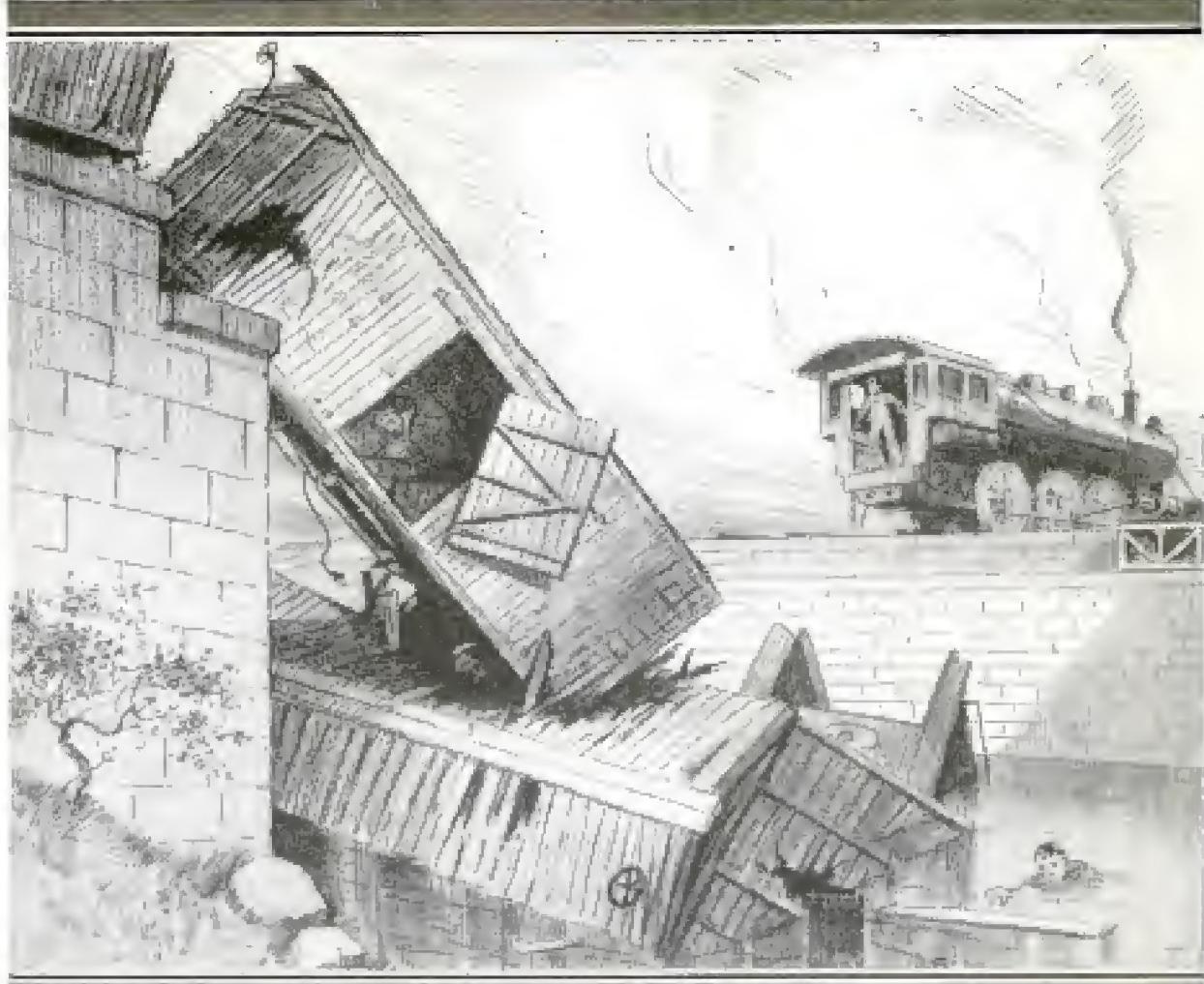
crossties after jumping the span left vacant by an opened drawbridge.

The locomotive had been at the head of a fast freight previous to the accident. It was down-grade to the bridge, and the draw was open. It was impossible to stop. The train plunged ahead, and the locomotive reached the opposite side of the channel and alighted right side up and undamaged. The tender fell into the opening, and cars piled up in a heap between the two abutments.

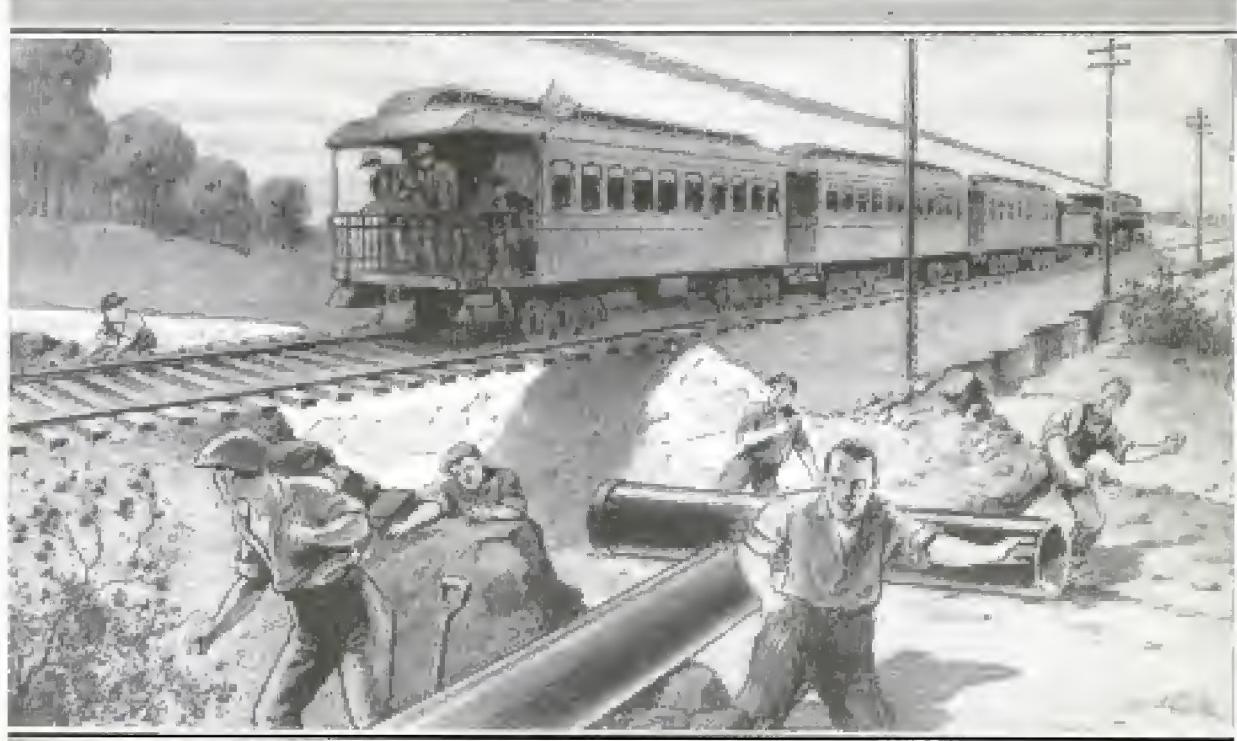
I asked for a copy of the photograph, but was politely refused. Railroads do not care to advertise their accidents—naturally.

Of a different kind but equally strange was a mishap which occurred on an eastern railway. A long freight was coming off a steep grade when something caught the truck of a car near the center of the train. Almost instantly this car fell to one side and tumbled down the embankment. At the same time the car following was wrenches free and thrown clear, on the opposite side of the track. Then, as if to put the finishing touch on this odd performance, the rest of the train eased down and coupled onto the forepart of the train.

An engineer in the maintenance-of-way department of a mid-west railway told me the following story, which I afterward verified, for it was difficult to believe.



"The locomotive reached the opposite side of the channel and alighted right side up and undamaged. The cars piled up in a heap between the two abutments."



"At this stage 15 feet of steel rails spanned the opening. From them the cross-ties hung by the spikes. Underneath the ties there was nothing but air. There came the rumble of an approaching train. The red flag had blown down."

A small stone culvert was to be replaced by an iron pipe. There was a sufficient interval between regular trains to complete the work. Red flags were posted at the prescribed distances in both directions. A gang of workmen excavated the small fill over the culvert and removed the stone.

At this stage of the work, 15 feet of the steel rails only spanned the opening. From them the cross-ties hung by the spikes. Underneath the ties, for a height of some 6 feet, there was nothing but air.

There came the distant rumble of an approaching train. It was a "special,"

and the red flag having blown over, it came rushing on at full speed.

One and all, the workmen dropped their tools and ran headlong into the open field. The foreman ran, too, not venturing to look back, and expecting every second to hear the seemingly inevitable crash.

Finally, at a safe distance, he turned to look.

The special was fast disappearing from sight. It had crossed 15 feet of unsupported rails and continued on its way!

Not only had the locomotive jumped the space, but, to the amazement of all, three cars behind it had safely negotiated the hazardous crossing.

9019

VANCOUVER THEATER BEATS HIGH COST OF GROUND

Ingenious use has been made of a very narrow street frontage by the builders of the new Capitol Theater at Vancouver, B. C., occupied by a motion-picture concern. Frontage on the street in this section, which is the center of the fashionable shopping district, is very high-priced, but a street at the back is a very quiet one, still given over to boarding houses and residences.

A site that was large enough for the new theater was easily obtained there, and the much-to-be-desired access from the busy main street was assured by the purchase of a narrow strip of ground only sufficient for the lofty entrance and lobby. It was necessary, however, to avoid interference with the traffic along the lane which traverses the block, and this difficulty was solved by a combination of sloping walks and stairs, which raise the approach sufficiently, by the time the lane is reached, to leave plenty of headroom underneath for any traffic likely to make use of it.

The effect obtained by this simple arrangement is very satisfactory, for as one steps inside the doors, a vista of fairyland opens out, the decorator having been given a free hand to make the most of the long corridor leading to the theater building proper. To the ordinary sights and sounds of a busy street this quiet and beautiful passage forms a pleasing contrast, and the sense of distance, so rarely obtained in city buildings, is magnified by a succession of arches and the great height of the ceiling. The effect is intensified by the clever disposition of mirrors, and by the series of beautiful candelabra which hang from the ceiling and from brackets on the walls. A short stairway of marble, the full width of the corridor, leads to the entrance of the foyer itself, which, owing to the peculiar construction, is considerably higher than would otherwise have been necessary and gives direct access to the balcony. Other stairways lead to the main auditorium floor.



From Left to Right are Shown: The Frontage of the Theater on the Back Street Where Property Is Cheap; the Front Entrance to the Theater on the Busy Main Street Where Property Is Expensive, and Part of the Approach That Spans an Intersecting Alley without Interference with the Traffic.



In the Illustration Above, the Robe is Shown Extended. Notice the Extra Width of the Top Section, Which Allows Ample Covering for the Passengers. These Strips Fold In When the Robe is to be Run Back into the Footrest.

AUTOMOBILE ROBE ROLLS INTO CYLINDRICAL FOOTREST

An automobile robe, recently invented, is attached to a spring roller fastened inside a cylindrical footrest. When not wanted, the robe is easily run back into its container which is shaped like the ordinary footrest and differs only in the larger diameter of the cylinder and in its japanned finish. A heavy brass strip along the top prevents scratching. When drawn out, the top section of the robe unfolds at the sides, allowing ample covering. The cylinder, if desired, can be padlocked to prevent theft of the robe.

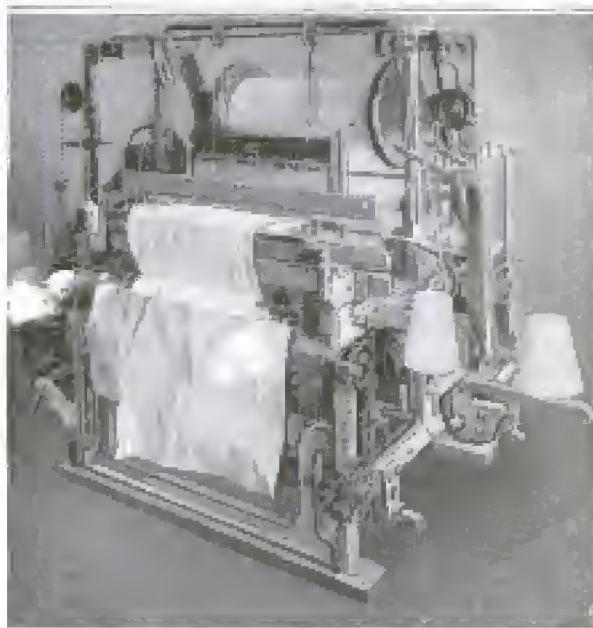
BLASTS OF COMPRESSED AIR REPLACE LOOM SHUTTLE

In a new type of loom the shuttle is dispensed with, and its work is done by means of compressed air. A filling-measuring device composed of chains, provided with filling pullers, works in connection with sprockets which are rotated with the loom parts. The filling, wound on large cones, passes through guide eyes in the line of travel of the filling pullers,



Above: Placing the Robe in the Footrest from Which It can be Run Back and Forth by Means of a Spring Roller. Left: The Footrest as It Looks When the Robe Is Not in Use. A Brass Strip on Top Prevents Scratching.

and sufficient filling is pulled off to make one pick. Then, by means of a cam on the sprocket wheel, the filling is released, and a blast of air from tubes located on the loom lay blows the filling between the warp shed.



In This New Type of Loom, Blasts of Compressed Air from Tubes on the Lay Replace the Shuttle

inv. John C. Brooks
425 Gerard St.
Paterson N.J.

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101 SMALL DRILL AND MARKER FOR GARDEN USE



Two Sizes of Garden-
Seed Drill, and Three
Views of Small Hopper



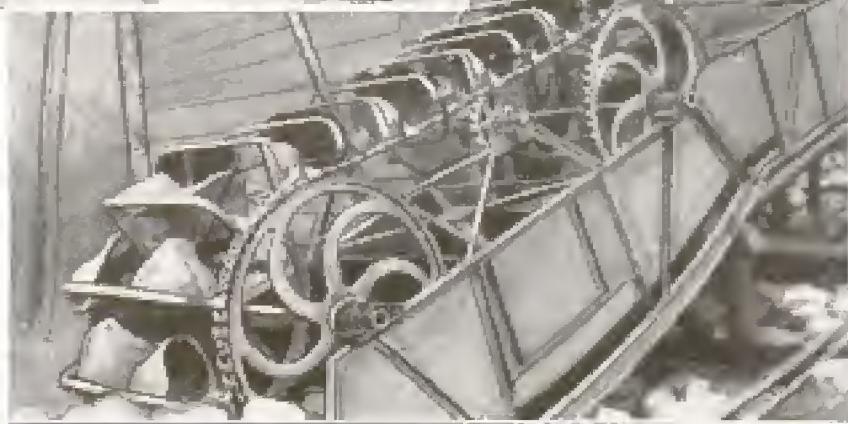
A foreign implement manufacturer is offering to horticulturists a small drill and marker intended to serve them as the larger seed drill serves the grain farmer. On top is a seed hopper with an opening in the bottom through which the seed is fed out by a revolving shaft having the supporting and marker wheels on its extremities. An adjustable slide regulates the quantity of seed fed into the small trench made by a projection from the body. The trench is afterward covered by means of a hand scraper. The seeder is made in two sizes, one for home gardens, and a larger one for market gardeners. The object is to speed up the planting and secure an even distribution of the seeds.

MOTOR FOR LOW WATER HEAD WITH SWIFT CURRENT



Side View of Motor for Use
with Low Water Heads and
Swift Currents: The End of the
Water Flame Is at Extreme
Right

A hydraulic motor, specially adapted for use where the water head is low but the current swift, has been constructed in British Columbia. Mounted in bearings on the sides of a water-tight metal extension of the flume that conducts the water to the motor are two large sprocket wheels driven by a chain. Laterally connected to this chain are a series



Front View of the Motor, Showing How the Open Sides of Alternate Pairs of Buckets are Turned in Opposite Directions

tion to the next pair, and so on alternately to the end of the machine.

*Mr. John J. Johnson, P.O., Vancouver,
Collingwood B.C., Canada*

Can. Henry England, 106
West Hastings Street, Vancouver.



Above: Hentzen in the Air on One of His Successful Flights with the Motorless Plane "Vampyr." Left: Close-Up of Hentzen in the Same Machine, with Which He Established a World's Record

Aeronautics

GLIDERS AND SOARING FLIGHT

By R. C. FOLGER

434.

THE world's duration record for gliders—or sailplanes as they are more properly called—was established on August 24 at the German soaring and gliding meet held in the Rhoen hills, when pilot Hentzen, flying the sailplane "Vampyr," cruised about for 3 hours 7 minutes and landed some 1,000 feet above his starting point in apparent defiance of the law of gravitation. This performance equals Wilbur Wright's first public flights in Europe in December, 1908, when he made all previous flights appear insignificant by remaining in the air for 2 hours 20 minutes with his motor-driven machine.

However, the recent achievements in motorless flight, among the most notable of which is that of the Dutch airplane expert Fokker, who stayed aloft with a passenger for nearly 15 minutes, should not be looked upon as anything that will have a tendency to displace or even to any great extent supplement the motor-driven planes, but only as a means of making heavier-than-air machines more efficient. Although some see the possibility of sailplanes taking off from the cliffs of Dover and with a favorable wind flying across the English Channel to the shores of France, the ability of the gliders to

keep in the air is so dependent upon suitable wind conditions as to minimize the practical value of soaring in most countries. Without intending to detract from the laurels of the daring and skilled men who are doing so much to advance the art of flying, there can be little doubt the Rhoen hills and the propitious air currents arising from the valleys of the Gersfeld flying field contributed largely to their success.

A study of the conquest of the air takes us back many centuries, and we find the ambition of man to fly manifesting itself in strange man-driven machines with which they threw themselves into the air from the top of a prominent hill or from a tower, usually with disastrous results to the individual. So it was almost down to the present day, when the real era of gliding began as men became convinced that they must learn to fly as well as build the machines. Of this there is evidence in the experiments of the great pioneers like Lilienthal, culminating in the glider trials of the Wright brothers, preliminary to their later successful work with power-driven planes. In this connection it is interesting to note that as far back as 1911, Orville Wright remained aloft in his glider for 9 minutes 54 seconds at their

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private field at Kitty Hawk. The recent revival of interest in gliders and soaring flight has led to a more careful consideration of the flight of birds, by which students of flying have always been guided, and especially of those birds that are the best at soaring, like the sea gull, the buzzard, and the albatross. One of these magnificent soarers will sail through the air for a long time with wings motionless and with no apparent exertion, making use of what is often called the "internal energy" in the air. They will cant their wings to take advantage of the little puffs of wind that often carry them sharply upward, only to lose elevation a little later as the puff dies out or they lose momentum. Again flying directly into wind they are forced upward by the moving air. Sometimes, in finding a spiral current of air rising from the surface of the ground or from the sea, they will be carried almost vertically out of sight. Endowed by nature with an instinct for locating and making use of these varying puffs of wind and air currents, these birds are also equipped to utilize them efficiently, and they are provided with enough energy to propel them-

of sailplanes, it is certain he will never be able to equal the soaring birds, and then he will always be liable to sudden and unexpected descents in planes without some motive power. Some suggest that it is possible that pedal planes or planes of small power will eventually be the solution of this difficulty.

Getting them into the air is another drawback of the gliders or soaring planes. In all the trials of recent days even, it is necessary to start them off from the top of a hill, where they are projected into the air by means of some catapult device or by a number of men running rapidly down the hill and towing them by a cord until the plane has acquired enough velocity to leave the ground, much in the same manner as a kite is sent into the air. After the cord is cut, the plane continues to glide downward under the force of gravity until it gains sufficient speed to produce an upward impulse from the air impact against the properly set wings and horizontal rudder, to offset that force and maintain the plane in equilibrium. The plane may then soar around and even rise above its starting point, depending upon the efficiency of its design, the skill of the

pilot, the velocity of the wind, the character of the air currents, and the height from which it started.

In most of the trials in France and Germany, this year, a catapult or huge slingshot was used to start the gliders. The glider that Hentzen flew was given its initial momentum by the use of a long rubber



PHOTO COURTESY, UNDERWOOD & UNDERWOOD
Hydro-Sailplane in Flight over Water: Note the Towlne Leading to the Motorboat. It is Suggested That a Powered Airplane may Tow Several Sailplanes

selves through the air to prevent a fall when they happen into an air pocket or when they approach the surface of the earth. With all the knowledge that man may gain of the air currents and with all his increased skill in the design and operation



Glen H. Curtiss and the Hydro-Sailplane Which He Built at a Cost of Less than \$1,000: It is Made of Light Metal, and Weighs 140 Pounds



The Dutch Expert Fokker Seated in the Glider with Which He Made a Record Flight by Carrying a Passenger: His Assistant with the Camera Was the First to Take Photographs from a Motorless Plane

cord attached to the front of the craft by means of a large hook turned downward and open below. The plane was held steady while six men pulled the rubber cord, and when the command "start" was given, they ran against the wind, releasing the plane, which immediately rose. None of the sailplanes are heavy—varying from 80 pounds to 300 and 400 pounds—and therefore do not require much of a pull, especially when they are in the air, although they are difficult to handle on account of their awkward shape and frail structure.

costing less than \$1,000, which has been tested over Hempstead Bay, New York. In a number of attempts, in which the plane was started by towing it behind a fast motorboat, failure to rise was attributed to the dead calm that prevailed. Finally a slight breeze arose and, after being towed about a quarter of a mile at 35 miles per hour, the plane rose 12 feet above the water and remained in the air for 49 seconds after the towline was cut. Mr. Curtiss has visions of a flock of small hydro-sailplanes being towed behind the flying boat of the future.

German Women Assisting Pokker When It became Necessary for Him to Renew the Covering on His Bi-plane Glider, Which Carried Two Persons

No less an authority than Glenn H. Curtiss is optimistic over the possibility of water sailplanes to rise from the surface of the sea, in a desire to emulate the albatross. He has lately constructed a motorless glider, weighing only 140 pounds and

It is of interest to Americans that the only entrants from this country in the glider contests in France and Germany this summer, were three students at the Massachusetts Institute of Technology, headed by Edmund Allen. Before leaving for France, they completed the most successful glider trials held in America

since those of the Wright brothers, 11 years ago. Handicapped in a number of ways, these young men took a plane of their own design abroad, where unfortunate accidents prevented them from bettering the very creditable showing they made in competition with the most expert fliers of the world.

HEROIC RESCUE ATTEMPT BY ARGONAUT MINERS

DESPERATE crews of "hard-rock" men and "muckers" battled in shifts for 22 days, in a futile attempt to reach comrades imprisoned nearly a mile below the surface of the earth in the Argonaut mine, at Jackson, Calif. On August 27, fire on the 3,000-foot level trapped 47 men. Rescue parties were immediately sent down but found the flames raging so fiercely that the lower levels, in which the miners were caught, could not be reached. Experienced miners grimly shook their heads.

A plan was hastily conceived, of drilling from the shaft of an adjacent mine so as to connect with the Argonaut, at a

point below the fire. Thus began the fight for human lives. To drive a tunnel from the adjacent Kennedy mine, at the 3,600 or 3,900-foot level, meant a drive of more than 300 feet through hard rock and muck. Day after day passed. The grief-stricken families of the entombed men waited anxiously while the half-stripped and sweating miners dug, blasted, and tore their way through the intervening mass of stone and mud. Finally, on September 18, a tunnel connecting the 3,600-foot level of the Kennedy mine with the 4,200-foot level of the Argonaut property was completed.

First-aid parties again advanced into



First-Aid Party at the Mouth of the Kennedy Shaft Preparing to Make the Descent to the Tunnel Connecting with the 4,200-Foot Level of the Argonaut Mine, for the Purpose of Exploring the Different Levels of the Ill-Fated Mine to Determine the Condition of the 47 Men Who were Trapped There by Fire. All of Them were Found Dead in the 4,350-Foot Level behind a Double Bulkhead Erected by Them.

the ill-fated mine, this time below the impassable barricade caused by the fire, and, after hours of searching among the gas-filled levels, discovered a hurriedly

dead. The deadly carbon-monoxide gas had suffocated them. Although the efforts of the would-be rescuers terminated in failure, their devotion to their fellows

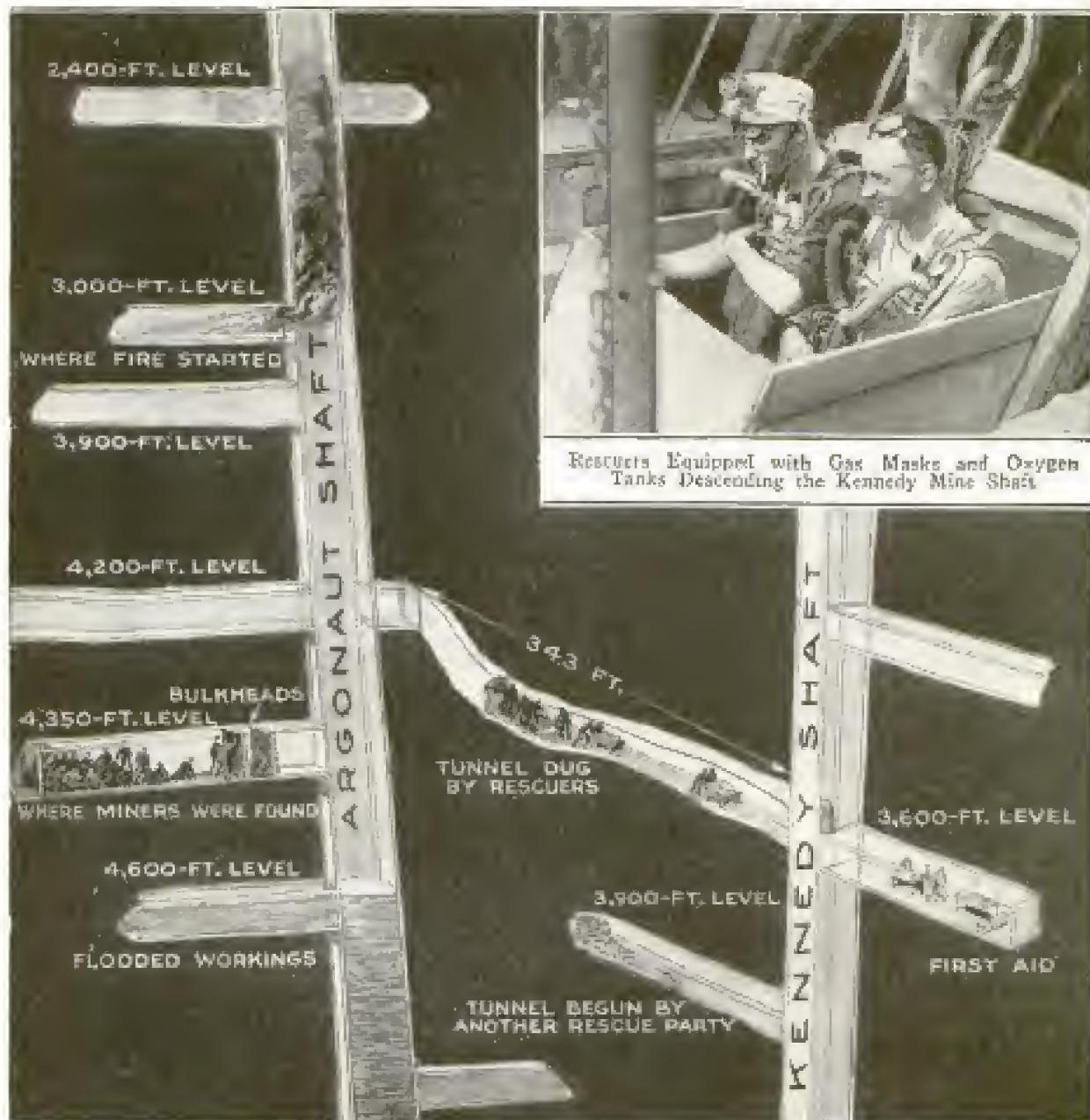


Diagram of the Argonaut and Kennedy Mines, Showing Their Relative Locations: In the Argonaut is Seen the Place in Which the Fire Started on August 27 and Below Which the 47 Men were Trapped. The Imprisoned Miners are Shown Building Bulkheads to Keep Out the Deadly Gas. The Rescuers are Seen Digging the Tunnel from the Kennedy Shaft in Which a First-Aid Station had been Established

erected bulkhead. This was quickly torn down. The apprehensive searchers proceeded a short distance farther and encountered a second bulkhead, the cracks in which had been stuffed with clothing torn from the trapped miners, thus giving pitiful evidence of the attempt to keep out the suffocating fumes.

This last barrier was likewise battered down and the first-aid party soon stumbled over the miners, huddled together—

and their stubborn persistence in their task remain as glorious. Mine accidents seem to occur periodically, and the toll of death sometimes reaches greater proportions than at the Argonaut; but in the display of pure heroism it called forth, no earlier disaster has ever surpassed it.

The country mourns the fate of the 47 miners, but thrills with pride at the recollection of their comrades who expended every human effort in the attempt at rescue.

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Letter from
J. W. H.

POPULAR MECHANICS

NEW CONTROL IN MOTOR CARS
OPERATES PNEUMATICALLY

Dispensing with the present emergency brake and gear-shift levers in any motor



The Motor-Car Control, Mounted on the Transmission Case, is Operated by the Lever with the Spherical Head at the Side of the Steering Wheel

car, the clutch, brakes, and gear shifts are controlled by means of pneumatic pressure of from 40 to 65 pounds, obtained from the motor, in a device of recent invention. The apparatus is mounted on the transmission case in place of its cover, and is operated by means of a small pivoted lever which, when moved backward 45° from the perpendicular, applies the brakes and disengages the clutch. When perpendicular,

the lever is neutral, and in this position, by turning a spherical head on top of it and handy to the driver, the transmission gears can be shifted as desired, and as indicated by pointers. To start the car in the selected speed, the lever is pushed forward to an angle of 45°. Reverse is obtained by pressing the lever down against a spring. With the new control it is impossible to strip gears, or to engage the clutch when the brakes are set. The service brake can be set independently of the emergency brake.

JUAREZ-MEXICO CITY AUTO ROUTE BEING PROMOTED

From Ciudad Juarez to Mexico City, following the right of way of the Mexican Central Railroad, is the route of a proposed automobile highway. The El Paso Automobile Club, promoter of the plan, hopes to obtain the needed funds by enlisting the aid of cities along the route, and also is confident of procuring the necessary grant from the Mexican government.

Commerce Report 4/17/22.

LIVE RATTLESNAKE INCLUDED

IN WINDOW DISPLAY

Considerable attention was attracted, recently, to a drug company's window, in which a live rattlesnake was displayed as part of an advertisement for a snake-bite remedy. To obtain as realistic an effect as possible, the cage in which the reptile was confined was provided with a painted background representing a typical desert scene. In addition, the window contained enlarged illustrations taken from an article entitled "Rattlesnake Etiquette," which appeared in the August issue of this magazine.



Window Display of Drug Company, Showing the Live Rattlesnake Confined in a Cage at the Center of the Window; The Background of the Cage was Painted to Represent a Typical Desert Scene

monarch Drug Co., San Diego.
Copyright International
Calif.

309 *Bentonite - Averyhee Chemical
Products Co., 9 & 11 W. Forest Ave,
REUSING OLD NEWSPAPERS FOR PRINTING Chicago
(Wiltonite) By FRED L. HOLMES, 115 W. Main St.
Madison Wis.*

BULGING waste-paper baskets of discarded newspapers in office buildings, stores, and homes, may become a national asset. The Forest Products Laboratory of Madison, Wis., has announced the discovery of a simple process for de-inking newspapers. Old newspapers are turned back into a pulp, and by the introduction of bentonite, a new American clay, the ink, which rises to the surface when loosened by alkalies, is carried off. The pulp is then put through the old well-known process and again made into newsprint.

The same paper can be de-inked several times, there being but a slight deterioration at each process. It requires the installation of no expensive machinery. Bentonite is a highly colloidal clay which exists in large deposits in the intermountain regions of the United States, particularly in Montana and Wyoming. One ton of clay is used to clean 10 tons of paper, and the prices of the clay and the paper make the process a profitable one.

After a series of experiments extending over a year at the Federal laboratory, the process was introduced in a commercial way in some of the large Minnesota paper mills with entire success. It requires about an hour to do the washing. Over 1,500 tons of old newspapers have been de-inked in these plants.

The United States consumes some 2,000,000 tons of newsprint annually, most of which could not heretofore be salvaged for reprinting because no satisfactory de-inking process had been discovered. It has required upward of 5,000,000 cords of wood to meet the annual print-paper demand. It is the belief

of laboratory officials that the discovery will materially check this wasting of the timber supply. For this reason, the new process becomes a commercial revelation of great importance in national economy.

Like many another remarkable discovery, this was made while experimenting on something else. When this mineral clay bentonite, creamy-white and smooth in appearance, was first discovered, it was believed that it would be a remarkable substance to

use in making the enamel of book paper. One day the engineer at the laboratory placed some of the clay in the vat of murky old-newspaper pulp that was being run through the beater. At once the sooty particles began to float off through the waste-pipe sieves. That was the beginning of 13 months of experiments in laboratory and commercial plants, with the result that business men pronounce the discovery a success.

Bentonite is defined by the United States Geological Survey as a transported, stratified, volcanic ash that has been altered shortly after deposition. It is very fine-grained and has the property of swelling in contact with water to several times its original volume into a jellylike mass, which on further dilution forms colloidal solutions and will remain in suspension indefinitely in mixtures as dilute as 1 part of bentonite to 50 parts of water. Like any natural prod-

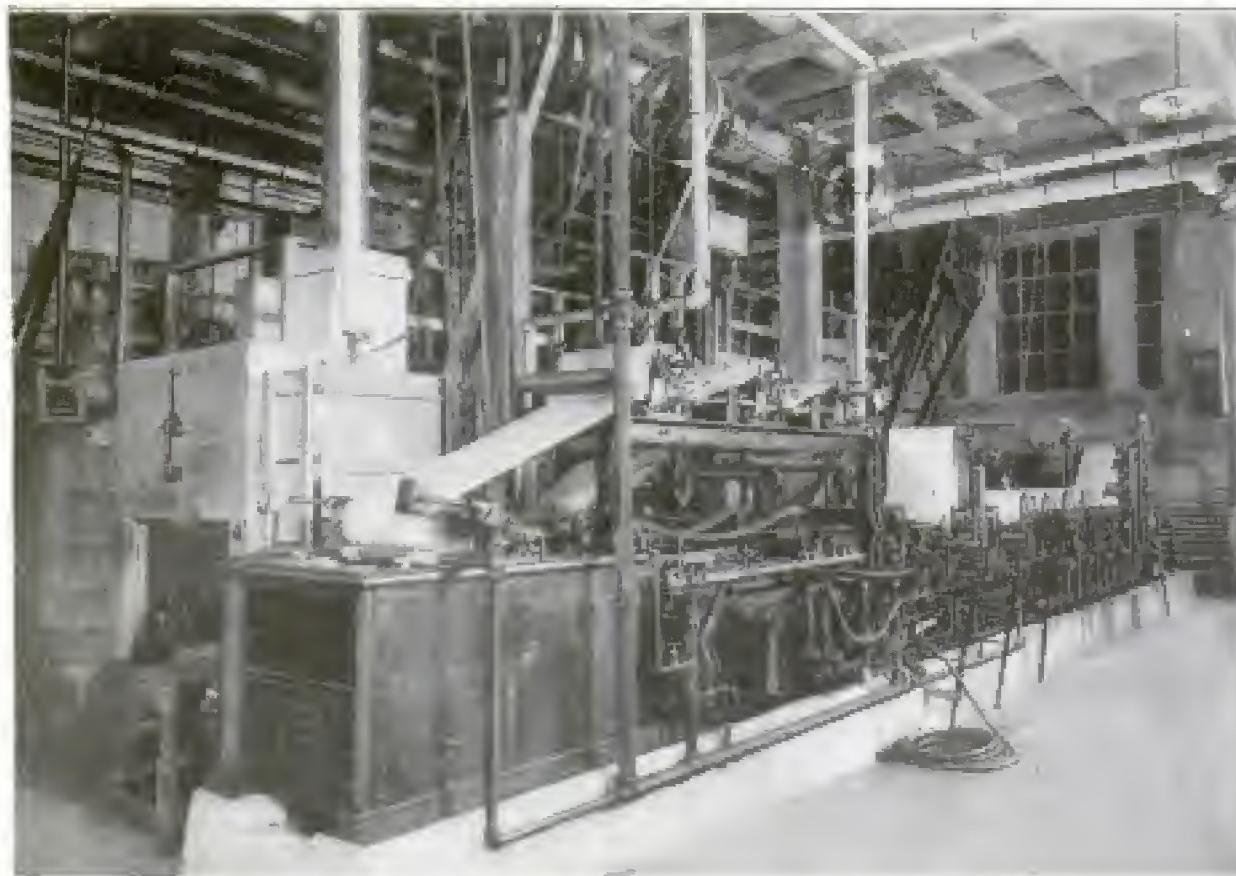


Lumps of Bentonite, Which Swells to Several Times Its Actual Size When Soaked in Water, Becoming a Soft Creamy Mass Like Corn-Meal Mash



In the Center can be Seen the Large Vat Used in the De-Inking Process and in Which Newspapers are Placed and Reduced to a Pulp; Then, to the Washing Solution in the Vat, is Added the Bentonite Which Removes the Ink from the Pulp

uct, different deposits differ considerably, and the finest-grained, or most colloidal, occur in Wyoming, although samples from many deposits in the state proved to be low in colloidal content. Samples freshly taken from the quarries are of a



Paper Mill at the Forest Products Laboratory in Madison, Wisconsin, in Which Paper of White Texture is being Manufactured from the Pulp of Old Newsprint Paper Treated by the Beatonite De-Inking Process

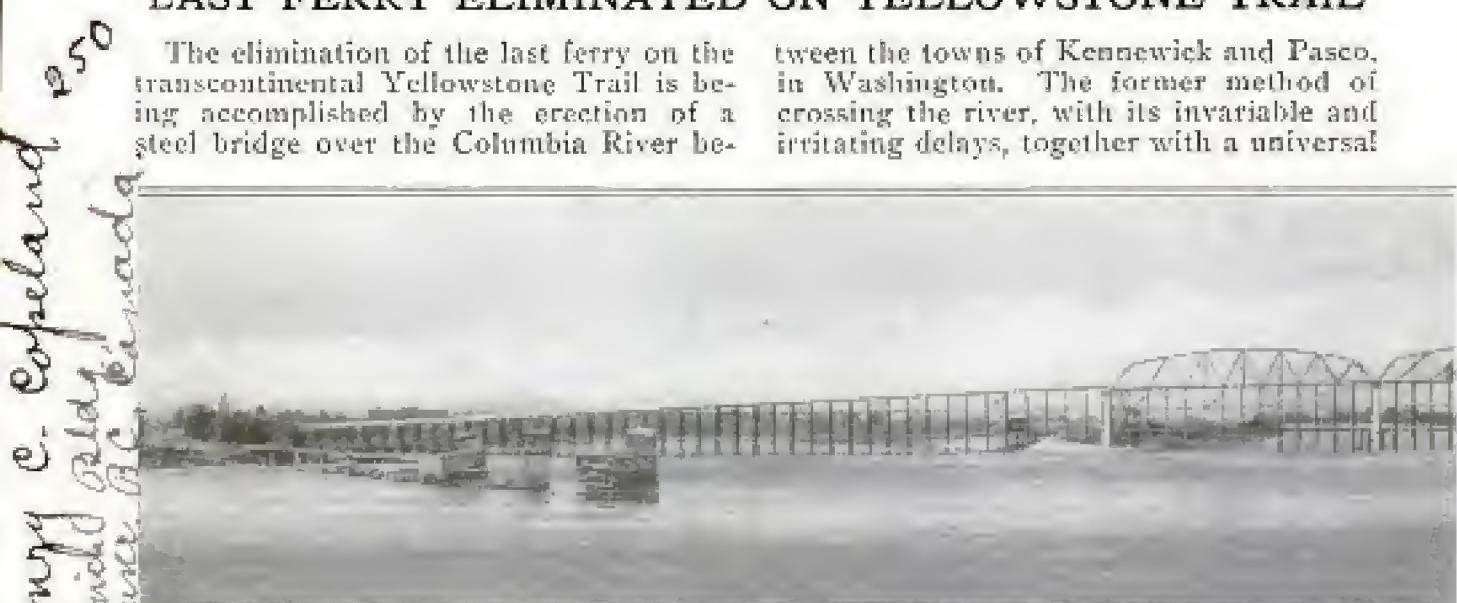
greenish-yellow color, but on exposure to the air become light cream. It is a mineral akin to kaolin, although generally yielding on analysis more silica, less alumina, and more magnesia, and has

been found to be an excellent filler for paper. It is its physical properties, however, that render it of most value in de-inking paper, and of these, fineness is of most importance.

LAST FERRY ELIMINATED ON YELLOWSTONE TRAIL

The elimination of the last ferry on the transcontinental Yellowstone Trail is being accomplished by the erection of a steel bridge over the Columbia River be-

tween the towns of Kennewick and Pasco, in Washington. The former method of crossing the river, with its invariable and irritating delays, together with a universal

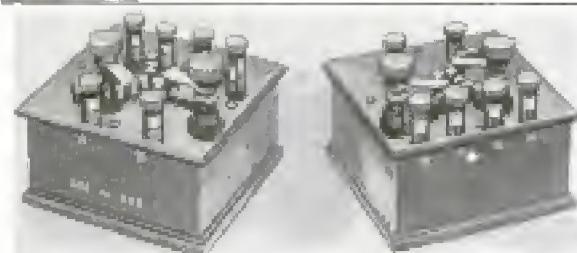


Partly Finished Steel Bridge over the Columbia River between the Towns of Kennewick and Pasco, in Washington, the Being Planned for the Formal Opening. This Bridge Has a Clearance, above the Water, Approximately 30 Feet in Depth at the Channel Piers, the Bot

desire for progress, caused the long-suffering citizens in that vicinity to demand a bridge. Subscriptions to the amount of \$500,000 were successfully solicited from interested persons along the trail between Seattle and Spokane, and construction started just one month after the necessary funds were raised in 1921. The completed structure, with the approaches, will be a half mile long, will have a 20-foot roadway, a center opening of 430 feet from pier to pier, and a clearance at high water of 50 feet.

7718 TUNER FOR RADIO RECEIVING —LIGHT AND COMPACT

That it weighs only 2 pounds and tunes to wave lengths of 100 to 600 meters, are merits claimed for a small and compact instrument which was given a practical test by the navy during the late war. Much of its efficiency is due to the minimum of space required. It is also said that the peculiar design of this tuner prevents, to a great extent, the interference by "strays" and static. "Foal-proof"



Radio Tuner Which Is of Light Construction, Thus Making It Adaptable for Portable Receiving Sets

features are incorporated which make it desirable for portable sets, Boy Scout outfits, or for simplified sets such as used by farmers in receiving the government market reports.

TRAFFIC SIGNALS OPERATED FROM SIDEWALK

270 Electrically operated signals which are controlled from the sidewalk are the



Copyright, International Newsreel Corp.
Electrically Operated Traffic Signal Which Is Controlled from the Curb by Means of Switches

latest improvements for the traffic police of Chicago. The signal is located near the curb and mounted on an iron post, at the base of which is placed the control mechanism. When on duty, the traffic officer stands at the edge of the sidewalk and by manipulating the different switches, flashes the "stop" and "go" signs as occasion demands, thus directing the flow of traffic.

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Completion of Which Will Eliminate the Last Ferry on the Transcontinental Yellowstone Trail: Elaborate Ceremonies are of 50 Feet, Thus Doing Away with the Necessity of Having a Drawspan. The River Is
toms of Which are Sunk 20 Feet below the Bed of the Stream

TWO MAY SIT SIDE BY SIDE ON NEW MOTORCYCLE

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Two persons may sit side by side on a new motorcycle having separate "saddles" and double sets of



Motorcycle Which Accommodates Two Persons Seated Side by Side, Showing the Odd, but Comfortable Footrest and Double Handlebars

handlebars, the latter being attached to the frame at a point just behind the front fork. Individual footrests are likewise provided. Thus, while comfort in riding is assured the transcontinental tourists, or casual "joy riders," the narrow width of the outfit, in comparison with that of the usual sidecar and third wheel, permits the owner to economize space in the garage.

DRAWING ROOMS EN SUITE ON TRAINS TO COAST

374
Santa Fe
Chicago

Steel sleeping cars, containing seven drawing rooms, and so arranged with sliding doors that they can be used en suite, are now being built for the Santa Fe Railroad, and will soon be placed in operation between Chicago and the Pacific coast. There are to be 18 of the newly designed cars. Each room is to have an upper and a lower berth, a day lounge and bed, and lavatory and toilet equipment. The new sleepers will be part



This Diagram of the Steel Sleeping Cars Soon to be Placed in the Transcontinental Service of the Santa Fe Railroad Shows How the Rooms are to be Arranged. Notice the Sliding Doors between the Drawing Rooms

of \$3,500,000 worth of steel equipment planned for the regular daily passenger service of this company.

ACROSS U. S. IN RECORD TIME

ON ONE-STOP FLIGHT

On September 5, Lieutenant Doolittle, army flier, landed in San Diego, Calif., about 22½ hours after he left Jacksonville, Fla. Stopping only once, at San Antonio, Tex., for fuel and oil, he averaged better than 100 miles per hour during the 21 hours 19 minutes that he was in the air. The 400-horsepower Liberty motor which drove his DeHaviland plane, consumed 399 gallons of gasoline and never missed a stroke on the 2,165-mile flight. In the early hours of his trip the lightning flashes of a thunderstorm he encountered, served to illuminate landmarks along the route. The only other incident was an attack of drowsiness while he passed over the monotonous plains of the Southwest.

USE PHONOGRAPH SOUND BOX AS RADIO AMPLIFIER

Sound boxes of phonographs may be used as radio amplifiers, by the attachment of a simple "adapter" to the tone arm of the machine, after first removing the reproducer. The appliance is constructed of a non-magnetic alloy. When the adapter has been fitted to the tone arm, one receiver is placed inside—the other being short-circuited—and tightly clamped there by means of a setscrew. In thus bringing the total volume of sound out through one receiver, instead of the sound waves opposing each other, as is the case when two receivers are used, the result is a clear and mellow reproduction of music or voices.



Westinghouse Laboratories 653
 Railway Exchange 3600
 Chicago

Workrum Co., 1410 Wrightwood Av., Chicago

TYPEWRITING BY RADIO

Typewritten Messages Sent from Airplane to Earth—Secret Radiograms Safeguarded by New Adaptation of the Printing Telegraph Machine—
Business Methods Also Benefited by Invention

87

BY H. A. LANE

ANOTHER chapter has been added to the wonderful story of radio. So many and so remarkable have been the adaptations of this method of communication, that the interested observer of the world's progress scarcely has the time to familiarize himself with one mode before another appears. The latest achievement is the sending of typewritten messages through space. This feat has been accomplished through the efforts of radio experts working in conjunction with the Navy Department, who have thoroughly demonstrated its practicability for scout

able kind; that is, as far as the keyboard is concerned. The usual radio equipment



Central-Station Sending Machine of the Printing Telegraph outfit, on Which the Messages are Typed in Page Form



Printing Telegraph Apparatus of the Page-Form Type Which Performs the Double Function of a Sending or a Receiving Machine

and battleplanes in time of war. Also, radio typewriting represents added efficiency for business methods.

To the casual onlooker, the sending apparatus of the outfit resembles the ordinary commercial typewriter of the port-

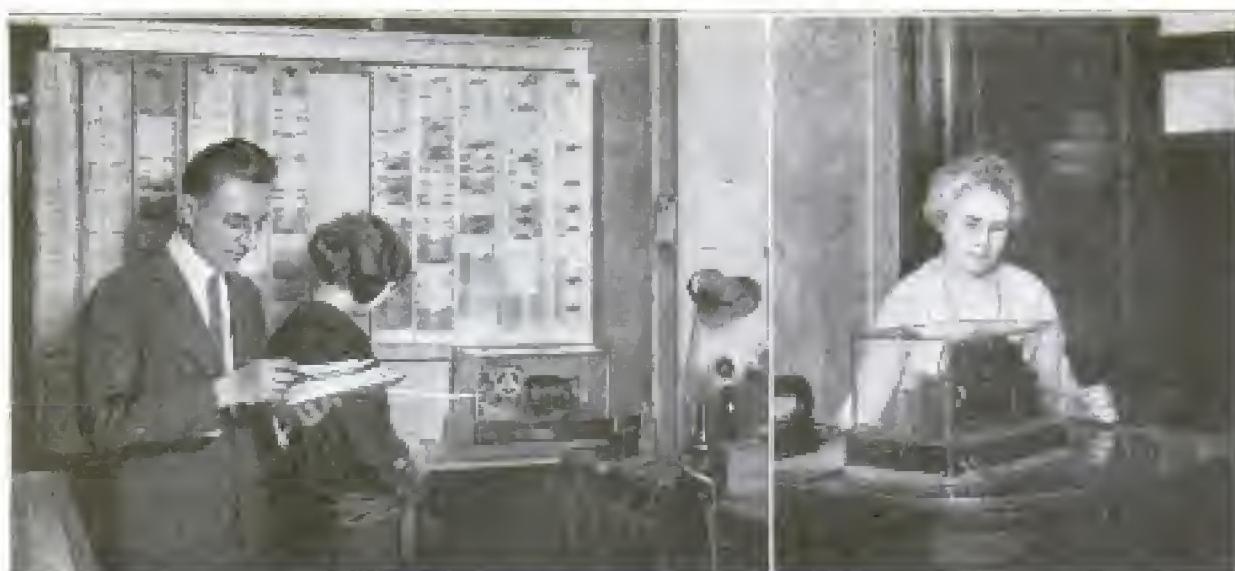
is carried on the plane, and in addition to this, the keyboard mechanism of the typewriter is installed in such a manner as to control the modulation circuit of the electron-tube transmitter. Thus, when a letter is struck on the keyboard, an impulse is sent out and received at a station on the ground. The receiving station, of course, has similar equipment to that on the plane. When any particular letter or number is depressed on the keyboard of the sending apparatus, a certain radioactive energy is released from the antenna of the plane and travels through the air. This is the common nature of radio.

Before any station can intercept these impulses, however, and decipher them, it is necessary to possess the same delicate



OFFICIAL PHOTOGRAPHS, U. S. NAVY

At the Left is Seen a Keyboard Transmitter of the Radio-Typewriting Apparatus Which is Carried on Airplanes, While on the Right is Shown the Wireless Equipment That is Installed in the Ground Station



On the Left is Seen a Printing Telegraph Machine, Installed at the Mail Clerk's Desk in a Hotel, While at the Right is Shown a Similar Machine Mounted on the Desk of the Room Clerk, by Means of Which She may be Informed, for Instance, That a Certain Room has Just been Vacated and Needs Clean Linen

and complicated apparatus that is used on the plane. Thus the messages are secret. As a further precaution, the keys on the sending machine may be arranged in different sequences, so as to emit different impulses, the change of letters being previously understood, of course, by the station to which the messages are being sent. Any change in the sending keyboard would have to be duplicated in the receiving instrument.

during the maneuvers of an army or fleet in war time, is thus clearly apparent; no less is its efficiency in the commercial world. Hotels, department stores, police and fire departments, in short, any organization that directs a large force of employes from a common center, may be benefited by another adaptation of this machine, which operates similar to the telegraph except that the messages are printed on a tape instead of appearing in code. It is, in reality, a printing telegraph. Hotels operating under this latter system, have an efficient method of catering to the interests of the guests by giving rapid service, of which the following supposition might serve as an instance.

A room occupant notifies the switchboard operator of his intention to leave hurriedly. The guest requests that his laundry, baggage, and mail be taken care of, and that a taxicab be ordered to take him to the railroad station. The telephone attendant immediately sends a message via the printing telegraph machine. This message is received simultaneously by the laundry, baggage, and mail clerks, the cashier, taxicab stand, and the captain of the bellboys. The hurrying traveler descends to the desk to pay his bill, and is extremely gratified to find everything in readiness for rapid departure.

In the meantime, the hotel management, as stated above, also derives benefits from this system in another way than merely by having pleased the late guest. The original message from the switchboard operator's machine is received by the floor clerk, whose duty it is to see that the vacant room is quickly made ready,



Telephone Operator in a Hotel, Transmitting Messages to Various Stations through the Medium of the Printing Telegraph Machine

The value of this invention in the transmission of secret orders and reports.

with clean linen, etc., for the accommodation of the next guest, who may even at that moment be impatiently waiting downstairs in the lobby for a room. Thus is the efficiency of the modern hotel increased.

Although these first machines were constructed so as to print the messages on a narrow tape, one of a later type prints on a full-sized sheet of paper, or letterhead. The advantages of this are numerous. All messages sent out from a central source appear at the receiving stations in suitable form for filing purposes. If the message is desired in duplicate or triplicate form, carbon copies may be made as with the ordinary typewriter. This page-printing machine has been chosen by the Police Department of Chicago. One sending apparatus, installed at central headquarters, delivers simultaneous instructions to 40 outlying stations, thus doing away with numerous telephone conversations, with their attendant risk of misinterpretation. Irritating and everyday errors are consequently eliminated, and by the elimination of mistakes,



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Sending Machine of the Printing Telegraph Outfit at Central Headquarters of the Chicago Police Department, with Which Page-Form Type-written Messages are Sent to 40 Outlying Stations.

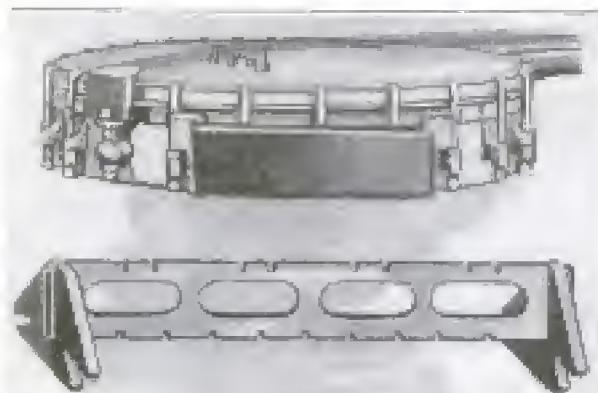
activities of all kinds are naturally accelerated.

Although the radio typewriter and other adaptations of the printing telegraph machine are still undergoing development, it is reasonable to assume that this method of communication will add to a nation's prosperity in times of peace and safeguard it in time of war. At any rate, the invention stands as a noteworthy addition to the practical application of wireless.

283

ADJUSTABLE BANJO BRIDGE AND CLOTHING GUARD

Two banjo accessories, a clothing guard and an adjustable bridge, are now available. The former consists of an elastic pad which fits over the brackets and nuts



At the Top is Shown the Clothing Guard for Banjos. While at the Bottom is Seen the Adjustable Bridge with Many Notches.

A. U. Aver,
Long Island City
N.Y.

of the instrument, thus preventing any wear and tear on the garments. The latter may be adjusted to different heights and has notches of various depths, on both sides, by means of which all members of the banjo "family" can be accommodated.

386

GULLS DROP CLAMS ON ROOFS TO BREAK THE SHELLS

Sea gulls congregating near Port Angeles, Wash., are fond of eating clams. The shells, however, proved difficult to open until, either through accident or ingenuity, the gulls carried the clams to a considerable height and dropped them on pavements or roofs, thus breaking the shells and getting a goodly meal. The roof of one building near the water's edge has been so badly damaged, it is said, that it is leaking. On another, wire netting has been put over the skylights to prevent their destruction.

Cont. Emma Norton
205 Northwestern
Bank Bldg.
Portland, Oregon

Westinghouse Electric & Mfg. Co., Pittsburgh NEW NAVY AIRSHIP-MOORING MAST.

By ERNEST JONES

East Pittsburgh for Washington, D.C.

THE mooring of the gigantic airship of today when arriving in port or departing, is not radically dissimilar to the docking of large ocean liners. For the pull and push of panting tugs there are substituted a mooring mast, winches, and a small crew of men. There is no river traffic, low tide, or the want of a pilot, to delay arrival at the scheduled hour.

The ship of the air gracefully approaches the mooring tower—or mast, to be technical—from the leeward and lets go her main hauling line. This is then connected by the ground crew to a line from a hauling winch by means of a coupling, and the ship is gradually pulled toward the head of the mast by electric power.

After the hauling in has begun, and when the bow of the ship is near the circle of snatch-block anchorages, two guy lines are dropped and connected to corresponding lines from auxiliary winches. These lines are led to snatch blocks which lie at 60° each side of the direction of the wind, and thence, by such lead blocks as may be necessary, to the auxiliary winches. These latter are operated until a mark on each line appears at the corresponding snatch block, when the auxiliary winches are stopped, the lines being simply held, and the main hauling line continues to draw the ship forward and down until the cone on the ship's nose enters the receiving member, mounted on a gimbal at the top of the mast, where ultimately it is locked in place, and the ship rides to the structure of the mast alone.

The passengers, baggage, and freight may then pass over a gangplank laid down from the corridor in the keel, through the underside of the nose, to the main platform of the tower. From another platform, a few feet below this, an elevator operates.

In leaving, the ship is trimmed sufficiently light to rise as soon as it is released from the mast, the releasing hook is opened, the ship rises, and the mast is again ready to receive.

Just completed at Lakehurst, N. J., the mooring mast of the United States Navy airship station is the tallest in the world, and the first to be erected without guy wires. It consists essentially of a triangular steel tower, somewhat similar to that of a radio station, in the center of a circle of 48 snatch-block anchorages at equal intervals of $7\frac{1}{2}^{\circ}$. The radius of this circle is 500 feet. Additional anchor-

ages for snatch blocks or fair-lead sheaves are located about the base, to make it possible to lead two lines from any of the two guy-line snatch blocks, 120° apart, to the two auxiliary winches in such a direction as to feed properly.

At the base of the tower is a building for housing 4 officers and 20 men, with an office, elevator entrance, and the winches for the lines used in bringing the ship to the mast, together with the pumps for water, fuel, and oil.

The elevator runs in an interior rectangular framework to a platform 136 feet above the ground. Twelve feet above this is the main operating platform, reached by stairs; and at 160 feet is the gimbal of the main swinging tube.

Up the tower, lead the pipe lines: one for water, delivering 18,000 pounds in an hour; fuel is pumped at 1,500 gallons an hour; a 12-inch pipe, with fabric tube to the ship, supplies 300,000 cubic feet of hydrogen or helium gas. An electric system is provided for night arrivals and departures; and there are, of course, telephones.

On the uppermost platform is the gear for receiving and securing the ship, together with the connections for the water, gasoline, oil, and gas piping which couple to the ship's lines.

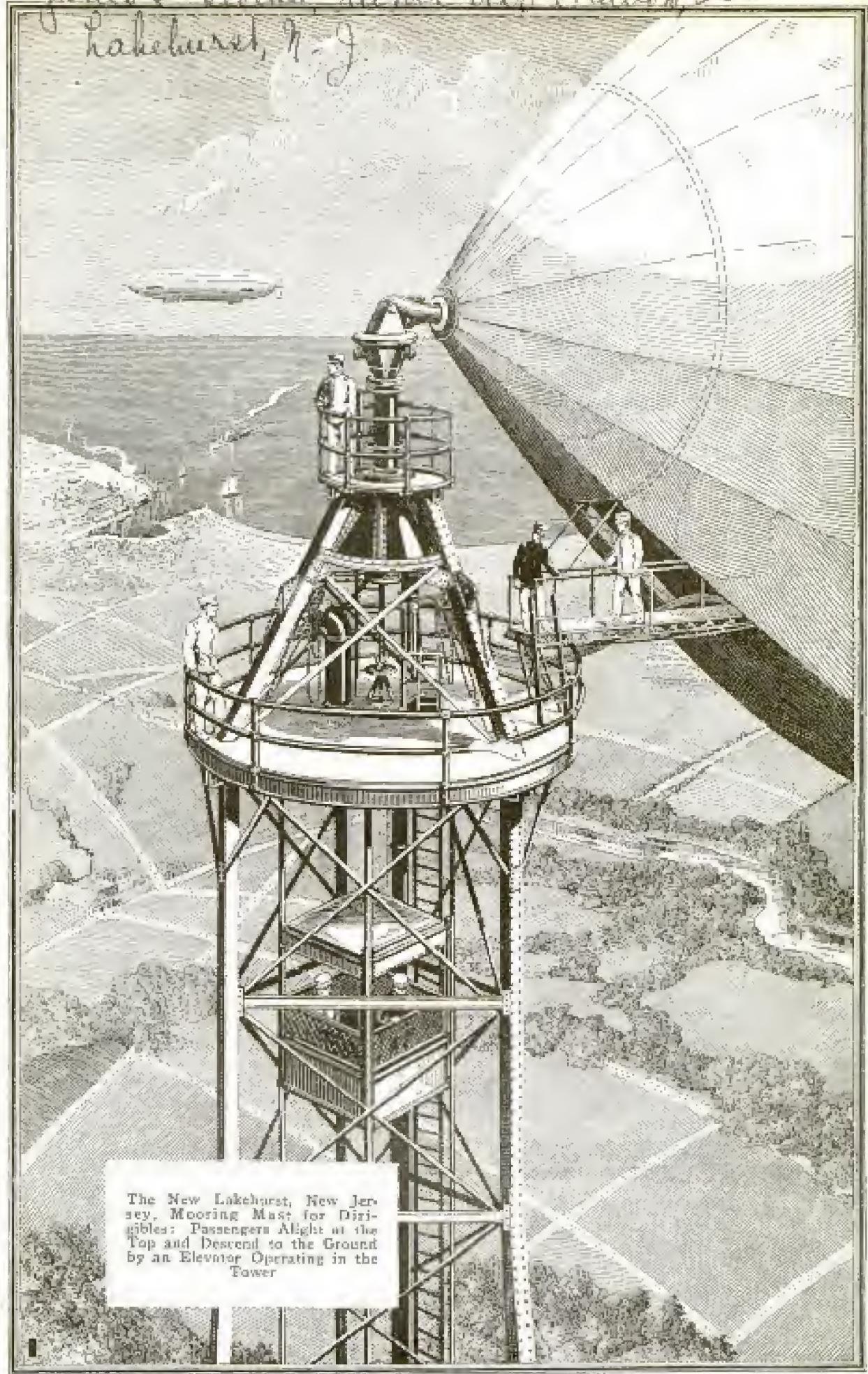
This receiving gear consists, in short, of a revolving steel cup on bearings, mounted on gimbals, with a spring device to take up shock at the moment of securing the cone of the ship in the cup, and a locking device.

366

TWO CITIES EXCHANGE POWER AS EMERGENCY MEASURE

The electric generating systems of Tacoma and Seattle, in Washington, have been "tied" together to safeguard each city against lack of power during unusually high demands or emergency conditions of any kind. Each municipality generates power at approximately 50,000 volts. The maximum amount of current to be exchanged is 15,000 kilovolt-amperes, and a water-cooled transformer of this capacity is used to tie the two systems together. The scheme is simple in operation. One side of the transformer is provided with a number of taps, through the medium of which any desired amount of the current, or all of it, can be interchanged from one set of lines to the other. The amount of the power interchanged is controlled by an induction regulator operated by two push buttons.

Bureau of Construction & Repair
Yards & Slots Naval Air Station, 366 101



695

Tuckahoe, N.Y.



Some Ornamental Signposts Erected in England: The Carvings are Inspired by Local Associations. From Left to Right They Represent, Famous Knight and Dame; Local Legend, and an Event in Early Church History

923 USING BIRCH WOOD FOR FUEL COMMON IN SWEDEN

Coal strikes would have little effect upon domestic heating in Sweden, for the most common fuel in that country is birch wood. The logs are usually cut up in



These Stacks Consist of Birch Wood, a Common Fuel in Sweden. They are Left to Dry for Several Months Before the Wood is Used.

winter, when the pieces are piled in large stacks to dry until the next fall. The fireplaces are so constructed as to store the heat, and practically none of it is wasted.

9949

HISTORICAL CARVINGS ADORN SIGNPOSTS IN ENGLAND

That road signs can be made ornamental as well as useful is evident from the examples of some that have been erected on King George's Sandringham estate, in the county of Norfolk, England. Above

the ordinary direction signs are mounted very elaborate and decorative designs depicting historical personages and events connected with the locality. Skillfully carved and solidly built, these artistic creations may represent an armored knight mounted on his prancing steed, some legend associated with the name of a neighboring town, or an event of early church history. They are unusually large for signposts, and very conspicuous.

9952 TALKING-MACHINE NEEDLE SIX FEET IN LENGTH

Measuring 6 feet in length, 7 inches in diameter, and weighing 10 pounds, the largest talking-machine needle in the world occasions great interest wherever it is placed on exhibition. The huge innovation, constructed entirely of steel in two telescoping parts, is more than 100 times the size of the ordinary needle used for playing records, and was manufactured by an Indiana concern solely for window-display purposes.



The White Mfg Co.
is not the end
Supplying material

New York City

ODD-APPEARING VEHICLE OPERATED LIKE BICYCLE

How to transport himself and family of five children at the same time, was the problem encountered by a European father of limited means, in the solving of which considerable ingenuity was displayed. Taking the wheels, gears, pedals, and chains from two bicycles, he constructed a strong frame, axles, and steering apparatus. Four wicker baskets, having a combined seating capacity of six persons, were then mounted on the vehicle, and now, with his eldest boy aiding in the pedaling, the father and five youngsters jointly partake of pleasure trips.

144



Odd-Appearing Vehicle in Which the Entire Family may be Transported, Showing the Clever Pedal Arrangement and the Wicker Baskets Used for Seats

AIRPLANE LANDING GEAR DROPPED IN FLIGHT

A recent invention permits the conventional landing gear with rubber-tired wheels to be dropped from a plane in flight, the subsequent landing being effected with a pair of skids mounted beneath the plane. The object is to eliminate the weight and wind resistance of the usual landing gear and to make possible landings in a short space and on rough ground. Landing on water

is safer with skids than with the wheels because of the lowered center of gravity, which reduces the tendency to turn the machine over on its end. The arrangement of shock absorbers, some of which are double-acting, interposed between the skids and the body of the plane, is one of the most important features. In this design the propeller blades must be horizontal when making a landing.



Above: Dropping the Wheel Landing Gear from a Plane in Flight. Left: Airplane Equipped with Combination of Regular Wheel Gear for Leaving the Ground, and Skids for Landing. Right: Making a Landing on Skids, Which can be Done in a Distance of About 50 Feet

*I. M. Lawrence A. S. Perry
Lawrence & Perry Aircraft Corp.
Farmington, L. I., New York*

Grown by Jas. B. Broadwell
696 POPULAR MECHANICS
241 *Alpharetta, Ga.*

RECORD STALK OF COTTON
HAS 700 BOLLS

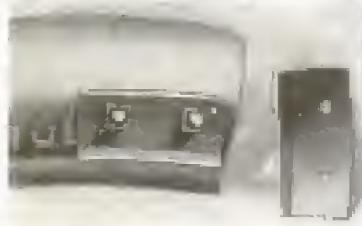
A cotton stalk, bearing 700 bolls and standing 5 feet 6 inches in height, was grown recently on a plantation in Georgia. As far as is known, this is a record number of cotton bolls to be grown on one stalk.



it will remain as a permanent exhibit for the benefit of sight-seers.

SHEET-STEEL TIRE PLATES
FOR MENDING RIM CUTS

A tire plate for mending rim cuts, made of the best sheet steel, is stamped to fit the tire and flanged to hook over the edge of the rim. The plate is about $2\frac{1}{4}$ inches long, and is drilled with two holes for small flat-head bolts with self-locking washers that go inside the tire. A belt punch is used for making holes in the tire that correspond to those in the plate. If the rim cut is long, two or more of the plates are placed side by side. They are made to fit both clincher and straight tires.



CAUTION USERS OF HARD-
COAL SUBSTITUTES

Persons intending to use soft coal, wood, kerosene, or other fuels as a substitute for anthracite, are warned that extra precautions are necessary for their safe usage, in a bulletin issued by the Na-

N.Y. Times 9/9/22

tional Board of Underwriters. Smoke-pipes and flues, states the bulletin, should be thoroughly cleaned before the furnace is started. Oil stoves should not be moved while lighted, and at all times should be kept away from inflammable household furnishings such as curtains. Office managers are advised to give special attention to their sprinkling systems so that they will not freeze from insufficient heat.

NEW MACHINE FACILITATES
9896 TIME-STUDY WORK

A recently marketed machine times and makes permanent records of time-study observations.



A strip of paper, positively driven, is moved at a uniform speed that can be adjusted to suit conditions. A pen, suitably mounted to trace a line on the paper, is caused to move back and forth across the strip by two finger keys at the option of the observer, who presses one or the other of these keys at the completion of each element of the cycle. The machine is small, weighs only $9\frac{1}{2}$ pounds, and is driven by a clockwork motor, so it can be easily carried about. It is more accurate than a stop watch.



This Time-Study Machine is Controlled by Two Finger Keys, and the Operator can Observe the Worker observations as low as .001 minute having been recorded, and the 24 steps obtainable provide for a record of all the data usually required.

*D. W. H. Williams
1613 Chestnut St.
Philadelphia, Pa.*

294 Pritchett-Thomson Research Laboratory
St. Paul's Hospital, Endell St., London, W.C.
POPULAR MECHANICS



Left: Machine for Mincing Microbes Shown Opened. The Larger of the Two Disks Revolves at High Speed around the Smaller Disk, with the Result That 20,000,000 Cuts per Minute are Made between the Two Sets of Knives. Right: Microbe Mincer in Operation under the Care of a Skilled Observer

MACHINE MINCES MICROBES

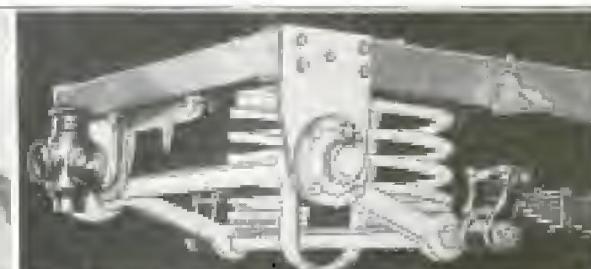
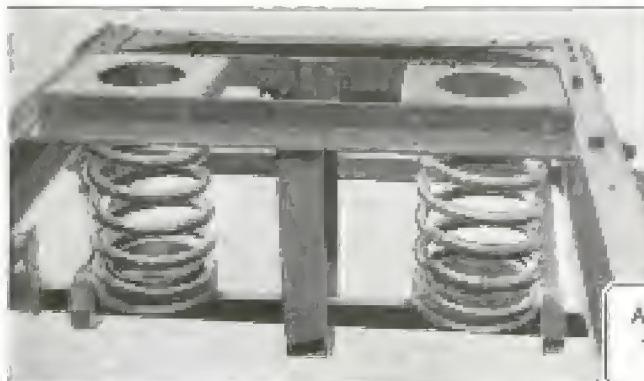
294 USED FOR VACCINE

An interesting little machine is used for mincing microbes in the laboratory of a London hospital. This electrically driven machine consists of two disks, of which the smaller or stationary one has 70 small steel knives and the larger or rotating disk has 80 cutting edges. The microbes, suspended in an alkaline solution, are forced against the cutting edges at a speed of 60 miles per hour, and during the 20 minutes they usually remain in the machine receive 560,000,000 cuts. But while some microbes are properly cut by this machine, others are so tough that they come through it whole and sound. A machine is therefore being constructed with 450 cutting edges, which will whirl the microbes at the rate of 120 miles an hour, giving 500,000,000 cuts per minute.

The object is to remove the poisons from the germs so that a larger quantity can be administered to the dose of vaccine, giving greater protection against the particular disease.

AUXILIARY COIL SPRINGS FOR MOTOR TRUCKS

Auxiliary coil springs for motor trucks are the latest improvement introduced for the purpose of reducing the jarring when driving over rough roads with solid tires. The rear ends of the ordinary leaf springs of the car, instead of being shackled to the frame, are fastened to a crossbar on which are placed two coil springs. The frame of the machine rests upon the top of these coils, which are limited in movement, except as to up and down, by a hinged arm affixed to the crossbar.



Auxiliary Coil Springs. Showing How They are Attached to the Frame of the Machine, and How the Leaf Springs are Shackled to the Crossbar

Taylor Engineering & Mfg. Co.
Cornwells Heights, Pa.

Copyrighted material

346 A. N. Mirzaoff, 269 Leland Ave
EXPOSITION BUILDINGS AT RIO DE JANEIRO
Plainfield, N.J.



Part of the City of Rio de Janeiro, Showing
Entrance to the Harbor: The Exposition
Grounds and the Main Part of the City Are
to the Left of This District



Gateway to the Exposition: The Brazilian
States Building Is at the End of the Street,
the Administration Building to the Right,
and Small-Industries Pavilion to the Left

FOR BRAZILIAN CENTENNIAL CELEBRATION



View of the New Market Building at the Northern Boundary of the Exposition Grounds, Looking North: In the Foreground Are the Fish and Game Pavilion with Statistics Pavilion behind It



Part View of the Plaza in Front of the New Market Building, Showing at Right the East Front of the Industries Palace, and in the Center the Old Fort with Its Tall Tower

Inv. Edgar Gerry Tillyer, Southbridge, Mass.



Above: The Inventor of the New Method of Testing the Accuracy of Optical Lenses is Here Seen with the Instrument He has Perfected. Right: Another View of the Instrument, Showing the Means of Holding a Pair of Spectacles



INSTRUMENT MEASURES LENSES BY LIGHT WAVES

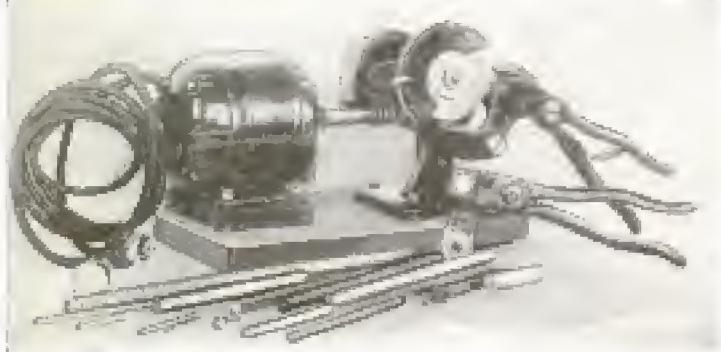
259 By means of a new instrument perfected by an American scientist after a number of years of labor and experimentation, it is now possible to determine whether the lenses of eyeglasses and other optical devices have been accurately ground according to the prescribed formula. Heretofore the means for testing optical lenses have been only ap-

proximately accurate and more or less liable to human error. This instrument uses the light passing through the lens to measure its power, as a resultant of the combination of surfaces to which it is ground, and takes into account the refractive index of the glass of which it is made. As it combines the advantages of the other methods, none of which is complete in itself, and eliminates the defects peculiar to each, it is seen as the means of standardizing the testing of lenses for eyeglasses, the benefits of which will accrue to the millions of persons who are dependent almost entirely upon these aids to vision.

HIGH-SPEED BENCH SAW CUTS HARD OR SOFT METALS

Easily portable, a bench saw has been designed specially to save metal, saws,

and time. The machine is equipped with a small circular saw, only $\frac{3}{16}$ inch thick, covered by a guard and driven through worm gearing by a $\frac{1}{6}$ -horsepower enclosed motor that can be connected to any lamp socket. The saw can be driven at a very high speed for cutting soft metals, such as brass or copper, and at a much lower speed for hard metals, such as cold-rolled steel or drill rod. Attached to the saw support is a plierlike adjustable work holder that grips the metal while it is being cut. The saw cuts very rapidly, and, on account of its thinness, makes a clean cut with small waste of material. The saws can be interchanged for cutting the different metals.



Portable Bench Saw, Weighing 40 Pounds, for Hard or Soft Material, That can be Run from Any Lamp Socket

Triangle Metal Products Corp.
3, Hartmann St., Worcester, Mass. Copyrighted material

COMMENT AND REVIEW

[These pages were printed September 26, 1922.]

IN these days nations have become so large, and so attached to their home land, they no longer emigrate in a body, as history tells us was done by the Israelites, Aztecs, and others. Even the tremendous influx which this country experienced during the past 100 years, coming from almost every nation of the world, had begun to subside before legislation put limitations in force. The flow of emigration toward Australia, Africa, and South America, which are the remaining great unsettled continents, is relatively slow, and at a rate in no way comparable to the thousands which poured into the Dakotas, and west thereof, during the 80's.

*A Place
in
the Sun*

Writing in the Yale Review, Henry Pratt Fairchild makes the statement that the world's population in the 114 years ended 1914 more than doubled, going from 700 million to 1,649 million; while in the five years from 1906 to 1911 it increased at the rate of doubling every 60 years.

The startling result of such increase for 10,000 years is inconceivable. Mr. Fairchild says that after filling the standing room of the earth's surface by allowing each person one and one-half square feet to stand on (a little crowded for overweights) there would still be 69,750,000,000,000,000,000,000,000 individuals left over, with not even "standing room only," or to confine the figures to the United States, the rate of increase from 1906 to 1911 would give us, at the end of this century (1999), a population about one-third larger, on a territory one-fourth smaller than China today. And we think of China in terms of "teeming" humanity!

Against this appalling future Mr. Fairchild offers consolation in the words, "There is no more pernicious proverb than that history repeats itself. That is the one thing that history never does." (Disraeli also frequently said the same.)

Another surprising statement he makes is, that emigration does not reduce population, and that land aggression, hostile or peaceful, fails to solve the problems of overpopulation. "We could draw off a million Chinese a year," he says, "for 50 years, and at the end of the period China would have just as large a population as if not a soul had emigrated." The prospect is that in future the efforts and inducements held out to attract emigrants to the United States, Canada, Brazil, Argentina, and Australia will be lessened, and legislative restriction may be expected. Mass movements of population from one country to another will not long be permitted.



WHEN the war broke out our supply of coal-tar dyes, medicinals, and chemicals in great variety was suddenly reduced, and later, of course, was entirely cut off. We had depended on Germany so long and to so large an extent, that for a time our manufacturers were greatly crippled. The home production of these essentials had been so poorly supported and encouraged, we found ourselves in a surprising state of impotent dependence.

*Encourage
American
Dyes*

Our manufacturers of chemicals then set to work to produce these necessities here, but they were confronted at the very beginning with hundreds of American patents which the Germans had taken out for the sole purpose of blocking manufacture here.

Later, when we entered the war, these owned-in-Germany patents were taken over by the alien-property custodian under act of Congress, and still later he was authorized to sell them at public auction, as no Government agency existed which had authority to acquire them. Therefore, a corporation was formed, which was as nearly as possible a quasi-public one, and this organization—The Chemical Foundation, Inc.—became the holding company for these patents.

The Chemical Foundation is controlled by five trustees, none of whom owns any of its stock or is himself a manufacturer. While limited dividends are permitted under its charter, it has paid no dividends; its president receives neither salary nor expenses, and all moneys received above expenses and dividends must be devoted to the advancement of chemical science and education in this country. It has authority to license manufacturers under the patents it acquired, but cannot give an exclusive license. Any American citizen could procure the same license, on precisely similar terms, with assurance of security and encouragement from the

Government. American manufacturers took licenses under these patents and invested more than \$100,000,000 in new plants.

Considering the short time in which they have been experimenting and operating, the results are highly encouraging. Many dyes and chemicals are already produced here which are equal to what formerly came from Germany; others are admittedly inferior, but it must be considered that Americans have only begun, and have made really wonderful progress in their three years, as contrasted to the more than half a century of similar manufacture in Germany.

Naturally, in their attempt to regain their former world-wide markets in all other lines, the Germans resent our entrance into an industry which they led and practically controlled, and hence they seek to recover their lost patents here. In furtherance of this effort, a bill is before Congress to restore to them the American patents they formerly controlled. To do so would be a repudiation of its recent promises by the Government; would throttle a most important and essential industry, and would cause an irreparable loss to the country at large, and personally to those who have put their millions into the new chemical enterprises here.

Great Britain, France, Italy, and Japan have already passed laws creating a complete embargo against the importation of such dyestuffs as are made in their respective countries; and Great Britain has gone farther, and is subsidizing the industry to enable its manufacturers to compete with Germany in the markets of the world. What is known as a "selective embargo" on dyestuffs is now before Congress. It would seem we too should promptly institute such a protective embargo here, and not restore the patents taken over by the Chemical Foundation.



THE Government has its coast guards, and sentinels to prevent and fight forest fires; and some states already have a mounted state constabulary. It is rapidly becoming evident that, at least all the more densely populated states, will have to have their state police.

State Mounted Police

Time was when a traveler was as safe from attack on a country highway as in a courthouse, but this is so no longer. The more miles of good roads a state provides, the more automobiles it has, and the easier it becomes for bandits to make their holdup in store, house, or highway, and escape in a stolen car. Where the theft occurs in a town or city, its police cannot go very far afield in pursuit of the robbers, and the small towns and country communities have only a limited force.

A state mounted force, a good proportion on motorcycles, properly distributed, could be put in action very quickly as a dragnet, making escape much more difficult than under present conditions. As the chances of escape became more difficult and unlikely, crime would automatically largely decrease.



SAWING a Woman in Half" is the well-known title of an illusion which has created a furore wherever presented. It was conceived by Horace Goldin, who is receiving larger royalties from other magicians who are presenting the mystery, than has ever been paid in the history of magic. The apparatus used in the act was also invented by Mr. Goldin and built in that famous workshop of secrets maintained by Thurston in Long Island. Like all other great successes, there sprang up rivals, which were stopped by injunctions in Illinois, Pennsylvania, and Ohio.

Magicians' Rights Recognized

Then a moving-picture producer, more enterprising than just, succeeded in getting possession of the secret of the mystery. A film was made showing the regulation stage performance, and following this was a complete exposé, fully illustrated, showing exactly how the mystery was accomplished.

Mr. Goldin sought to obtain an injunction against the manufacturer and the showing of the film, but was refused in a lower court. On appeal to the Supreme Court of New York State, the judges, five in number, unanimously decided in Mr. Goldin's favor and reversed the ruling of the lower court.

It is unnecessary to recite in detail the evidence and arguments on both sides. The evidence proved conclusively that Mr. Goldin was the originator of the

mystery, but the interesting feature is that the court recognized the mystery as a tangible property that can no more be appropriated or stolen than a horse.

The decision, coming from so high a tribunal, establishes a precedent of untold importance to magicians, who will now feel warranted in spending money—as Mr. Goldin did several thousands—in inventing and constructing the apparatus necessary to produce what is known as a major mystery, and rely on legal protection of their rights. The outcome will doubtless be of the greatest encouragement to the profession to produce new and wonderful features of entertainment which the amusement-loving public will appreciate and enjoy.

The Society of American Magicians and Harry Houdini, its president, are to be congratulated on this legal victory which means so much to all of them.



TWENTY years ago when gliders were being flown by such scientists as Lilienthal, Canute, Picher, and the Wrights, they were the subject of jest and scorn in the daily press. Only a few years later they were being made and flown by boys as a new and startling amusement. This experimental work, however, established the foundation for what became, with the aid of the gas engine, the present airplane. Of late, considerable interest in the glider has been revived by remarkable achievements, especially in Germany. Some have even dared to predict the powerless plane as a practical vehicle of the air.

While it is true some wonderful flights have been recorded during the past year, the glider promises to be very limited in its operations, and of little dependable use except as a landing plane from passenger express planes; to improve the airplane by further discoveries of the gliding ability of birds, and as an amusement. Some people are misled by the endurance of certain birds to remain aloft apparently motionless for a long time, into the belief that gliders can duplicate bird flight; but did anyone ever see a bird rise from the ground or water by merely spreading its wings and facing the wind? Or an eagle step off from some lofty tree or mountain crag and only spread its wings? The bird takes its start with wing propulsion, and largely, if not entirely, makes its ascent by the exercise of wing power, even though the wing motion is too slight to be detected by an observer on the ground, hundreds or thousands of feet below. The glider is a vassal of the wind and can no more go in any direction desired, at any moment, than a stuffed bird.

Its use therefore can only be quite limited, and certainly very much less than many have been given to expect and hope.



EVER since the invention of the pistol 400 years ago, its sole purpose and that of its successor, the revolver, was to kill human beings. Outside of legally authorized war, they have undoubtedly caused the accidental or murderous death of a thousand for every life saved by their justifiable use. The possession of such arms should be limited to military and police forces. For the hunter, the farmer, the explorer, and for target practice, the larger firearm affords quite sufficient service and protection. The concealed weapon is very seldom of value to any but the lawbreaker. The chief of one of the largest city police forces in this country says that more than 90 per cent of the sales of revolvers at the present time are to the criminal classes.

The revolver is really the weapon of the coward; without it the thug and holdup man would immediately lose his nerve in most cases, and would soon abandon his profession. Holdups in offices are of daily occurrence because one or two dash in and cover the occupants with "guns," but if these same bandits tried to accomplish their purpose with rifles, crowbars, or clubs, the results would be vastly different.

Some cities have tried to limit and control the sale of small firearms, but the effort is practically a failure because evasion is so easy, and then there is always the mail-order dealer sending goods in plain packages to fictitious names. If the bandit is afraid to purchase from regular dealers or pawnbrokers in town, he has the shipment mailed to some small suburb, a few miles out, where both he and the nature of the goods he receives are unknown and excite no comment.

*Gliders
a
Fad*

*Abolish
the
Revolver*

350 h. Clark

A Chicago business man, John R. Thompson, a year ago advertised a reward of \$1,000 to anyone who would send him one really good reason (outside of military or police) why the manufacture of revolvers in this country should be allowed to exist. He has yet to receive a single convincing reason.

The alarming increase in crime and murder made possible by the possession of revolvers, has become such a national menace that nothing short of a Federal law prohibiting their importation, manufacture, sale, or possession (outside of museums, and military or police) can abate the evil. All possessors of revolvers should be required to turn them over to Government officials, and a heavy fine, or fine and imprisonment to fit the case, should then become effective. Criminals, fearing the strong arm of Government and finding it less easy to evade penalties, would be less inclined to carry arms, and as fast as arrested would lose what they had. We have too many laws now, but this is one more that would produce widespread and immediate good results, without depriving anyone of a necessary personal right.

Many publishers, recognizing the assistance which their columns were giving the criminal class by advertising revolvers to be sent by mail, are now voluntarily refusing to accept such advertising, although in many cases perfectly reputable firms were included in the ban. This magazine adopted such a policy months ago. Our Government should itself manufacture what few concealable firearms it permits to be used, and prevent all others from doing so, and from importing.

H. H. WINDSOR

STUMPS ARE QUICKLY BURNED WITH AIR-BLAST OUTFIT

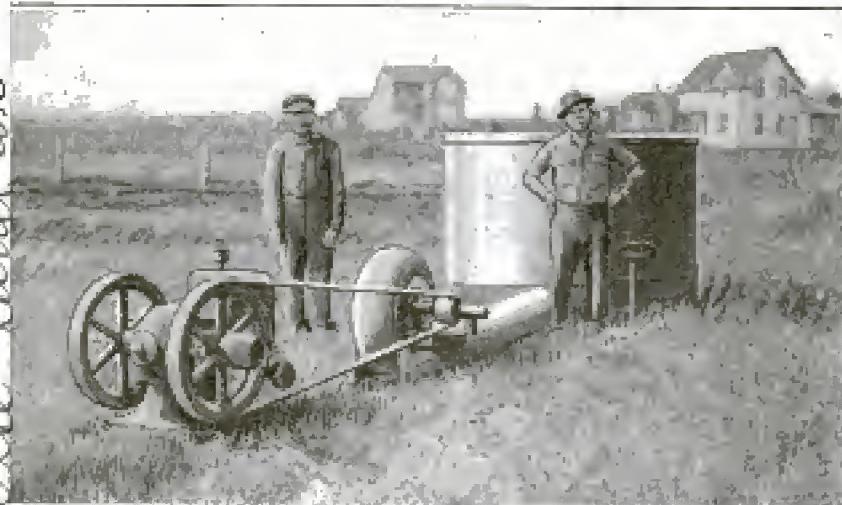
Stumps can be quickly burned with the use of an incinerating outfit consisting of a blower driven by a gasoline engine, and a sheet-iron jacket which is placed over the stump to be destroyed. After the apparatus is in position, a fire is started at the base of the stump, and is steadily fanned with the engine-driven

a blower with sufficient capacity to supply several jackets with blasts may be utilized, thus making it possible to burn a number of stumps at one time.

RECREATION AND CAMP SITES GIVEN STATE OF MICHIGAN

Eleven park sites, ten of which have lake or river frontage, have been presented to the state of Michigan to help offset the congestion at the few remaining open parks and bathing beaches, resulting, it seems, from increased automobile travel. The new parks are all in the lake district around Detroit and consist of 627 acres of natural wood and lake country. Only one is without water, and that is a rugged stretch noted for its beautiful scenery. The purpose of the donation, as stated by the Dodge Brothers, is to provide a memorial to the late John F. and Horace E. Dodge, for whom the parks are to be named, and to give motorists places where they may have their picnics, games, and bathing without encroaching on private property.

Detroit Mich.



Air-Blast Outfit Which has been Successfully Used to Incinerate Stumps, Showing, from Left to Right, the Gasoline Engine Belted to the Blower Fan, and the Large Cylindrical Sheet-Iron Jacket

air blast until the wood is entirely reduced to ashes. The apparatus is safe, simple, labor-saving, inexpensive to operate, and does a neat job, and if desired,

named, and to give motorists places where they may have their picnics, games, and bathing without encroaching on private property.

9906 Photos from: Atlantic Photo Co.
Berlin, S. W. II, Königgrätzer Straße

POPULAR MECHANICS

705

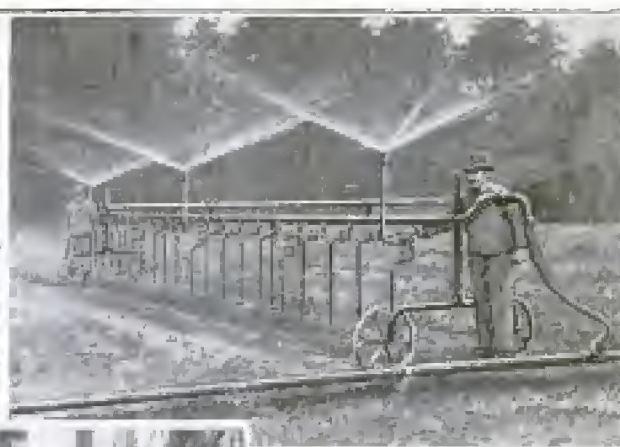
PORTABLE SPRINKLERS WITH POWER-DRIVEN PUMPS



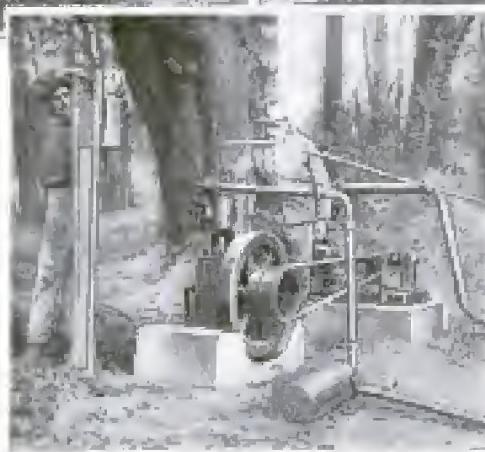
Large Portable Field Sprinkler with Its Suspended Discharge Nozzles in Use Throwing Streams of Water in Parallel Lines

9906

Large portable field sprinklers operated by gasoline engines and pumps, are in use in Germany, especially where intensive cultivation is applied. Each sprinkler, mounted on a pair of wheels at each end, consists of a long horizontal system of piping in connection with three vertical spraying nozzles above it, and with about 20 smaller sus-



Portable Sprinkler with the Upright Spraying Nozzles in Use, Showing How They Cover a Wide Area of Ground Evenly



Gasoline-Engine-Driven Pump Which Furnishes Water under Pressure by a Hose Connection to the Sprinkler

pended pipes with discharge nozzles just above the ground level. The spraying nozzles cover evenly a wide area, and the hanging nozzles drop streams of water in parallel lines. The sprinkler can be operated at some distance from the source of water supply, where the pump is located, and which has a hose connection to the sprinkler.

240



KATH SEAPLANES ARE NOW ESSENTIAL IN NAVAL MANEUVERS

DURING recent maneuvers of the U. S. Navy, large seaplanes have accompanied the fleets and kept in constant touch, by radio, with the battleships. This type of plane is now an indispensable factor in naval operations, acting as a scout, and also directing the maneuvers.

248

SMOKESTACK THAT SPECIALLY ATTRACTS LIGHTNING

Attempts are being made to ascertain what causes the attraction of lightning



COURTESY, CHICAGO & N.W. RAILROAD

to a smokestack 150 feet high that is located at the intersection of Elston and Webster avenues, Chicago. In the immediate vicinity there are some 22 other smokestacks of about the same height, and not one of them has been struck this year, whereas this particular one has been struck three times. The first time 50 feet of the top of the stack was demolished; the second time about the

same length was split, and the third time the lightning spiraled down the full length of the stack and reached the fire box of the furnace.

BATTERED, BENT, AND BROKEN CAR MAKES RECORD

Battered, bent, and broken, an American small car of a well-known make recently established an unparalleled record for consistent performance under the most adverse circumstances. This car, the property of the American relief, was driven across the great sand steppes of southern Russia and was the first machine to accomplish the passage of these wastes. However, even this car paid a severe penalty for the feat. After the long and dangerous trip, the tiny "Car of Juggernaut" came literally "limping" back with the appearance and sound, according to eyewitnesses, of a large tin can on wheels. Somewhere on the history-making tour, a front spring had been broken, the main bearings had disappeared, the

clutch band had parted, the grease had left the crankcase, and the tires were punctured. The versatile driver had used string, rope, wire, and sundry other materials to bind and bandage the damaged parts, had made main bearings from an old lead pipe, filled the crankcase with lard and the tires with sand, but the unconquerable "flivver" came triumphantly "home" under the power of its own grinding and "knocking" engine.

SLIDE-RULE DEVICE SOLVES TRIGONOMETRIC FORMULAS

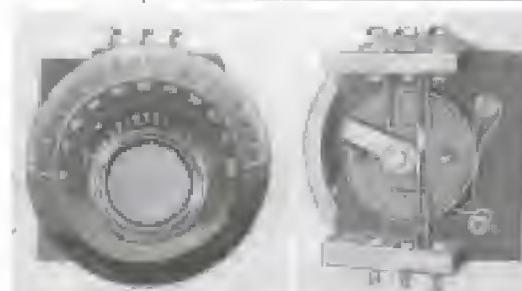
275

A new instrument combines the ordinary slide rule in semicircular form, with a supplementary half from which can be read the values and solutions of trigonometric functions and formulas, and which also serves as a protractor. It is made of celluloid of substantial thickness with a transparent runner arm, and its pocket-fitting shape makes it convenient for field or office use.

RHEOSTAT AND JACK SWITCH COMBINED FOR RADIO

234

A new combined rheostat and jack switch for radio sets serves a double purpose and eliminates the use of a filament-control jack. The rheostat, which is operated by turning a dial on the panel, consists of two small resistance coils, connected by a tiny wiperlike brush. At the extreme rear end of the dial shaft is a cam which causes the jack switch automatically to make contact whenever the dial is turned to bring the resistance coils into the circuit. By the combining of these two parts in one piece, the radio enthusiast can use a smaller cabinet and panel for his outfit, and consequently less



Left: Combined Rheostat and Jack Switch as It Appears from the Front of the Panel. Right: Rear of Appliance, Showing Contacts

wiring with less possibility of loose connections, so that a saving in space and cost, as well as added efficiency, are obtained.

The George A. Flynn Co
31 Claire St
Lowell, Mass

Price

of Chicago, Ill.

W. K. Mc Clever,

196 Curb George F. Paul
900 Ellsworth Bldg.,
Chicago



Scene at New Laredo on the Mexican Side of the Rio Grande, during the Flood This Summer, When the River Covered the Streets near the International Bridge under Two Feet of Water

196 TEXAS PLANS FLOOD CONTROL ON THE RIO GRANDE

THE Rio Grande, which forms the international boundary between Texas and Mexico, impresses the average traveler as a passive stream content to follow its sinuous course among the sand bars to the



Flood Damage Done to Offices of Custom, Immigration, and Health Departments Located at American End of International Bridge across the Rio Grande

Gulf of Mexico. During the dry season there are spots in its bed with barely enough water to refresh a team of horses, and yet Texans living along its banks in the summer of 1922 saw it rise in a few hours to a swollen torrent.



The International Bridge at Laredo, Texas, 40 Feet above the Normal Level of the Rio Grande, as It Looked at One Stage of the Recent Flood

Because of these experiences, the state of Texas is now planning to avert future floods, with their attendant loss of life and property, and remove the menace to important railroad centers. The new international bridge, at Laredo, had hardly been completed when the river suddenly rose in the recent flood to a height of 51 feet above its normal level, submerging the bridge under several feet of water

and entirely destroying the Laredo approach. For the first time, one block of streets beyond the bridge on the American side and several blocks on the Mexican side were covered with water, and the Immigration, Public Health, and Custom departments at the end of the bridge inundated. This flood was the worst since the one of 1919, when a high-water mark of 34 feet was recorded.

104

PERAMBULATING INCINERATORS IN CALIFORNIA VINEYARDS

Far from ruining the grape industry, as was at first feared by those interested,



This Incinerator is Towed about Vineyards for Burning Grape Stalks and Weeds, So That the Ashes are Not Deposited in the Soil to the Detriment of the Following Year's Crop

prohibition has actually boosted the business. One way in which the increased prosperity has expressed itself is the ad-

vanced method now used in the vineyards for the production of the best possible crop, both in quality and quantity.

After the grape crop is harvested the vines are cut off close to the ground, to grow up again the following year. Formerly the stalks were burned on the fields, but now it has been learned that the burning of grape stalks on the ground is injurious to next year's crop. To get rid of the old grape stalks, the growers now use wheeled incinerators in which the stalks are burned as the odd vehicle is drawn through the vineyards by teams of mules. The draft gear is lengthened, to keep the animals away

from the heat of the fire in the incinerators, and the ashes are hauled away in the same vehicle.

114

FOREST-SERVICE MEN HONORED BY MEMORIAL

Commemorating the brave men who lost their lives fighting forest fires in Idaho and Montana in 1910, the United States Forest Service recently caused a monument to be erected in the first-named state. The memorial is located in the heart of the St. Joe National Forest, and consists of natural stones cemented together and forming a rectangular enclosure, with a column rising at one side. On the column is a tablet bearing the names of four men and designating another simply as "unidentified." Beneath the names is the inscription:

"Died Fighting Forest Fires, August 20, 1910."

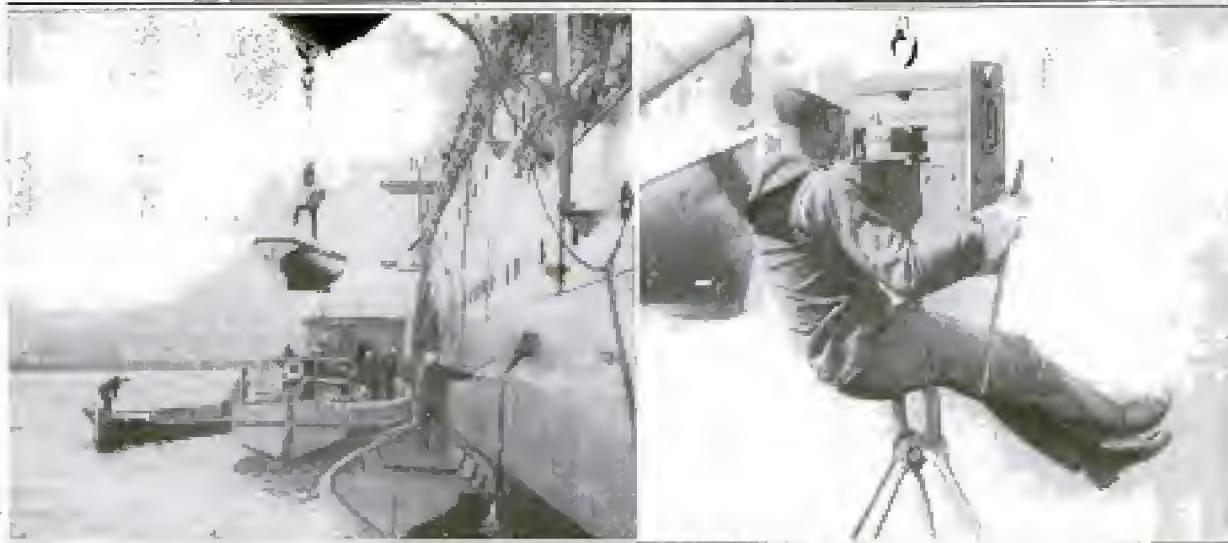


Monument of Natural Stones, Erected as a Memorial in Honor of Forest-Service Men Who Lost Their Lives While Fighting Forest Fires in Idaho and Montana in 1910

202 Civil-L.W. Pedrose, 1453 W. 54th St
Seattle Wash.

POPULAR MECHANICS

709



Left: Weighing In the Boat Representing the Battleship "California," Winner of the Recent Pacific-Fleet Boat Race, to Ascertain That It Had the Required Poundage of 1,650. Right: Close-Up of the Scale Used in Weighing the Boats, and the Sailor Who Acted as Official Weighmaster for the Event

PACIFIC-FLEET BOAT RACE 202 CLOSELY RUN

One of the most interesting events in the annals of Pacific-coast sportdom—the championship boat race of the Pacific fleet—was held on Lake Washington, Seattle, the last week in August, and was participated in by carefully trained boat crews from 11 warships, including the 1921 champions from the dreadnaught "Mississippi." The race was run over the usual two-mile course and was won by the "California's" crew. More than 50,000 persons witnessed the contest.

Every boat entered in the race had to comply with U. S. Navy standards. Testing the entrants was a matter of precision, and each boat had to meet a weight as well as displacement test. Each boat had to weigh 1,650 pounds; if too light, ballast was added to make up the weight. The crews, although constantly in the pink of condition, due to the nature of their vocation, spent several weeks in intensive training in preparation for the race. The thoroughness of this training may be judged from the fact that at the end of the two-mile race, four boats, entered by the "New Mexico," "Tennessee," "Mississippi," and "California," were grouped less than 9 feet apart, the close finish arousing great excitement among the spectators.

A 15-acre orange grove within the city limits of Anaheim, Calif., has been purchased at a cost of \$45,000 by the Chamber of Commerce as a site for the annual Valencia Orange Show, held in May, each year.

BODY OF MOTOR CAR BUILT 69 TO IMITATE CHURCH

Constructing an imitation church on the chassis of a small motor car of well-known make, was the method adopted by a New York minister literally to take his sermons to the people. The odd-appearing vehicle, in which he intends to tour the country, has windows in front, doors at the sides, a steeple on top, and a pulpit at the rear, from which he preaches to the various gatherings.



Imitation Church and Its Pastor, Shown Ready for the Beginning of the Country-Wide Tour of Preaching

Rev. Standard Clark
New York City

Mr. H. C. Cooley
Sales Mgr. Western Electric Co

710 POPULAR MECHANICS
84 Marion St., Seattle Wash.

"FOOL-PROOF" TIRE FILLER
PREVENTS ACCIDENTS

"Fool-proof" methods have superseded the old way of filling automobile tires,

which was a precarious task when the air-supply pressure was not known. The new way includes the installation, on the air line, of a gauge containing a movable indicator, in addition to the usual "hand." This indicator

is first set at the point on the gauge which the motorist desires his tire pressure to be. When this pressure is reached, the gauge shuts off the supply.

NEAT MATCH HOLDER FASTENS TO WINDSHIELD BY VACUUM

For the convenience of motorists a match holder has been devised which, by means of two rubber vacuum cups, can be fastened to the windshield, side-door window, dash, or any other part of the car that is flat and smooth. It is only necessary to moisten the edges of the cups and push them tightly against the surface, to which they adhere tightly.

APPLES ARE MONOGRAMMED IN WESTERN ORCHARD

Monograms were stenciled, this fall, on the entire crop of an apple orchard in the western part of the state of Washington. The name or the coat of arms of the consignees, for the most part large hotels, was put on in blue ink while the apples were still green. After they had ripened, the ink was washed off, leaving the design in pale greenish-yellow.



QUARTER-IN-SLOT MACHINES FOR RADIO SERVICE

256

Evidence of the popular trend of radio is the announcement of a manufacturer of wireless apparatus, of contracts for 25,000 receiving sets to operate on the deposit of a quarter. Most of the outfits are for hotels and hospitals, where a guest or patient can drop in a coin, as in a chewing-gum or peanut-vending machine, and hear concerts, market reports, weather forecasts, baseball scores, and news of the day for the next 12 hours.

SPARK PLUG SELF-CLEANING BY CAUSING AIR SUCTION

75



pressure, which has a tendency to suck oil into the combustion chamber.

REINFORCEMENT FOR BRIDGE ASSEMBLED ON BARGES

Engineers in charge of the construction of the new Belle Isle bridge, at Detroit, had the reinforcing steel for the concrete arches assembled on barges. Two steel barges were sunk under the timber framework upon which the reinforcement had been built up, and when pumped out, caused the whole section, with part of the framing, to lift clear of the temporary supports. The barges with their load were then towed into position at the bridge, and the section of reinforcing steel was lowered into place on the piers by letting water into the hold of the barges.

Ent. H. W. Nickle 502 1st St. N.E.
Seattle, Wash.

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New Belle Isle Bridge
Detroit Mich. 230



Above: Section of Steel Reinforcement, Weighing 97 Tons, for Concrete Bridge, at Belle Isle, Detroit, being Placed on Bridge Piers. Below: Section of Reinforcing Steel, Assembled on Barges, Ready to be Towed to the Bridge



W. R. McDooley, Elgin Radio Supply Co.

2848 Chicago St.

712

POPULAR MECHANICS

RADIO VARIABLE CONDENSER OF COMPACT DESIGN

235 A new variable condenser for radio equipment possesses many good features, chief of which are compactness of design



Front and Rear Views of Radio Variable Condenser, Showing Movable Plate Raised by Action of Dial Shaft Extending through the Panel

and cheapness in price. The appliance is constructed with a movable, but not rotary, plate, which is adjusted by the usual dial on

shaft through the panel. With this condenser, close tuning is made easier than with the rotary type, as three turns of the dial are necessary to vary the apparatus from its minimum to maximum capacity. In addition, the rigid construction causes the condenser to remain in adjustment regardless of any accidental knocks or jars.

195 DE-LUXE TAXICAB FITTED UP LIKE A PARLOR CAR

A sensation in motor cabs is one that has appeared fitted up like a parlor car, and with the beautiful finish and luxurious appointments of an expensive private limousine. The unusually large body has wide plate-glass windows which extend to the top, and may be lowered into the sides in warm weather, affording a wide range of vision. Extra-wide doors extend to the running board which is only 16 inches above the ground, to permit easy entrance and exit. The rear seat is an overstuffed lounge, while the others are large wicker chairs held to the floor by rubber vacuum cups, which the passenger can release when desiring to move the chair. The driver's compartment provides space for hand luggage. Cut-glass dome lights and flower holders, a vacuum water carafe, ash receivers, mirrors, and a folding table are among the other attractive features of this unusual commercial car.



Roomy Interior of Parlor Taxicab, Showing Comfortable Wicker Chairs and Large Windows



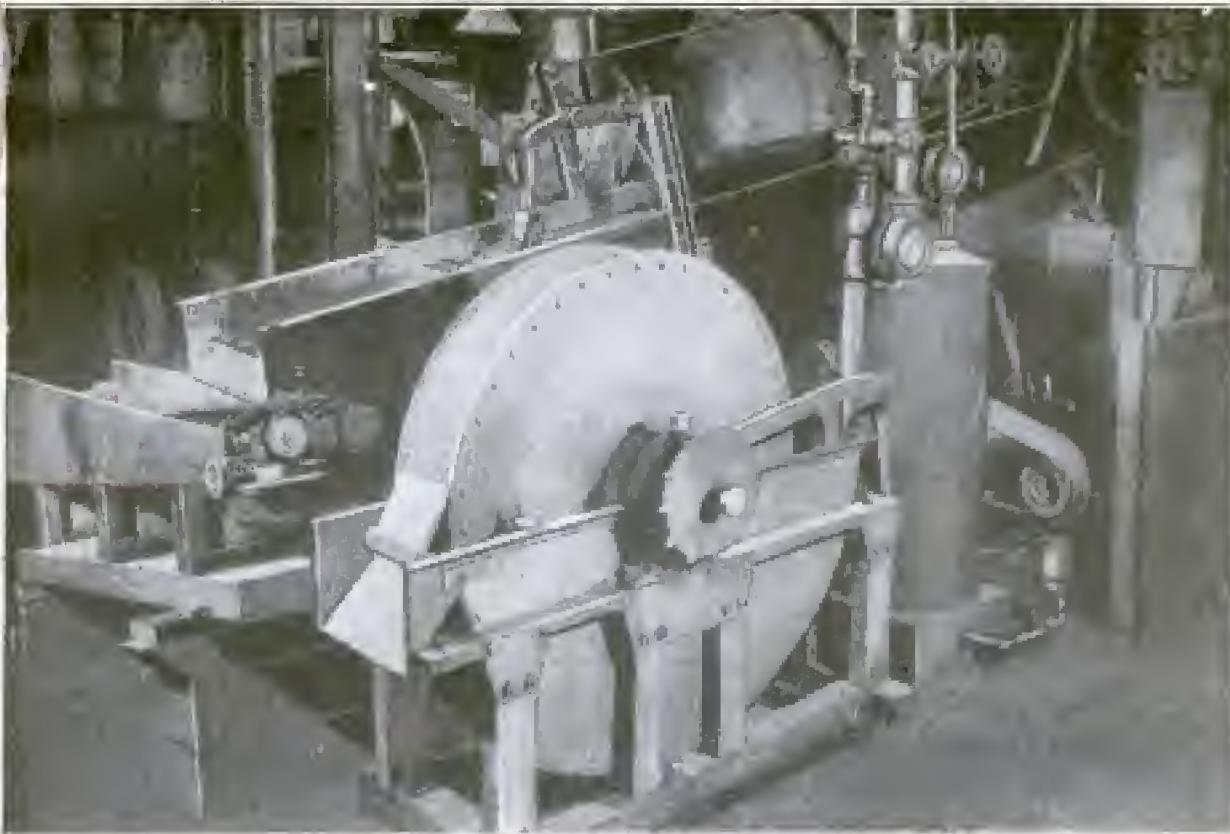
Left: Note Rubber Vacuum Cups Which Hold Chair Legs to the Floor. Right: Rear View, Showing Substantial Tire and Luggage Rack, and Large Air-Cushioned Shock Absorbers

Hageci Motor Co., Oakland - Calif.
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Equipment for Fine Grinding and Magnetic Concentration of Iron Ore: The Drum Filter is Shown in the Foreground; in the Center Is the Long Trough, or Classifier, at the End of Which is Shown the Magnetic Log Washer, While at the Top, in the Rear, can be Seen Part of the Pulverizing Ball Mill

TAPPING NEW IRON RESOURCES

By EARL CHRISTMAS, *628 Grand Ave.
St. Paul, Minn.*

UP AT Babbitt, Minn., an experiment of great importance is being worked out these days. If it succeeds, the life of the iron-mining industry in the Lake Superior district, instead of being limited to a score of years, may be doubled or tripled. Billions of tons of low-grade ore, hitherto regarded worthless, may be converted into iron. Under present mining methods, an ore cannot be mined profitably in this territory unless it contains about 50 per cent iron, and ores with a smaller iron content must be concentrated before shipment if they are to be utilized.

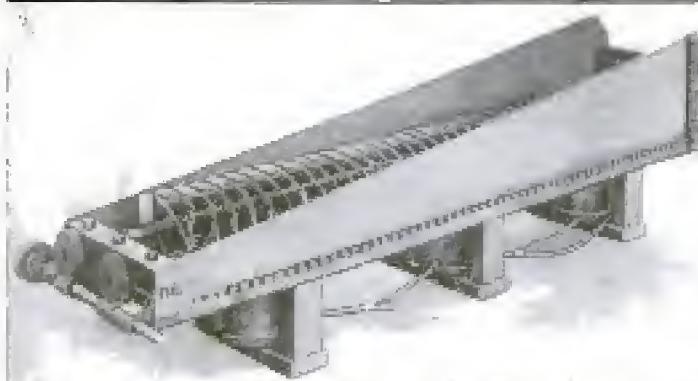
Magnetic concentration of the ore through a new process developed at the mines-experiment station of the University of Minnesota may be the solution of this problem. The process is being put into operation on a large scale

at Babbitt, at the eastern end of the famous Mesabi range, and represents the first big attempt of the kind to utilize the lower-grade ores.

Magnetic concentrators had been used before with materials of rather coarse nature, and with considerably richer ores. The mines-experiment station went farther and developed a device, known as

the magnetic log washer, which separates the iron from the rock in pulverized form. This supplied a missing link, as it were, and apparently has made possible the utilization of great stores of ores considered unprofitable.

Worked out on a small scale at the university, the process was tested by mining experts in a mill built for the purpose in Duluth. As a result of the tests, a plant costing \$3,000,000 is just being completed at Bab-



Magnetic Log Washer Which Makes Possible the Use of Billions of Tons of Hitherto Worthless Iron Ore, Showing How the Electromagnets are Placed beneath the Washer

bitt, the first unit in a large mill planned there. If this first unit proves the process is a success under actual conditions in the field, then many more units will follow.

Nor is this the only reason mining men are watching Babbitt with so much interest these days. Minnesota has great stores of hematite that cannot be utilized

be made magnetic by heating. Then, the ore may be treated by the process of magnetic concentration.

In the plant at Babbitt, large crushers will reduce the rock to pieces about 2 inches thick. It then passes through a device known as the "magnetic cobber," which excludes part of the nonmagnetic material. The magnetic cobber, operating with these coarser materials, has been in use for some time in other districts.

The process of crushing, cobbing, and discarding worthless materials continues until the ore is reduced to pieces about $\frac{1}{4}$ inch in size. Then it is pulverized in ball mills. The ore next goes to the magnetic washer, the final step in the process of separation. In this boxlike apparatus, magnets attract the magnetic materials to the bottom and

hold them there, while water, running through the washer, carries away the waste rock at one end of the log washer. The concentrate, containing about 64 per cent iron, is delivered at the other end.

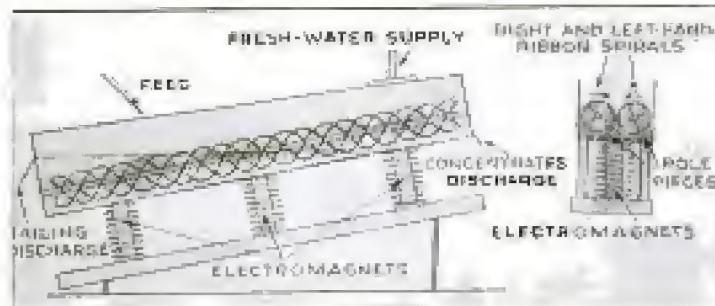
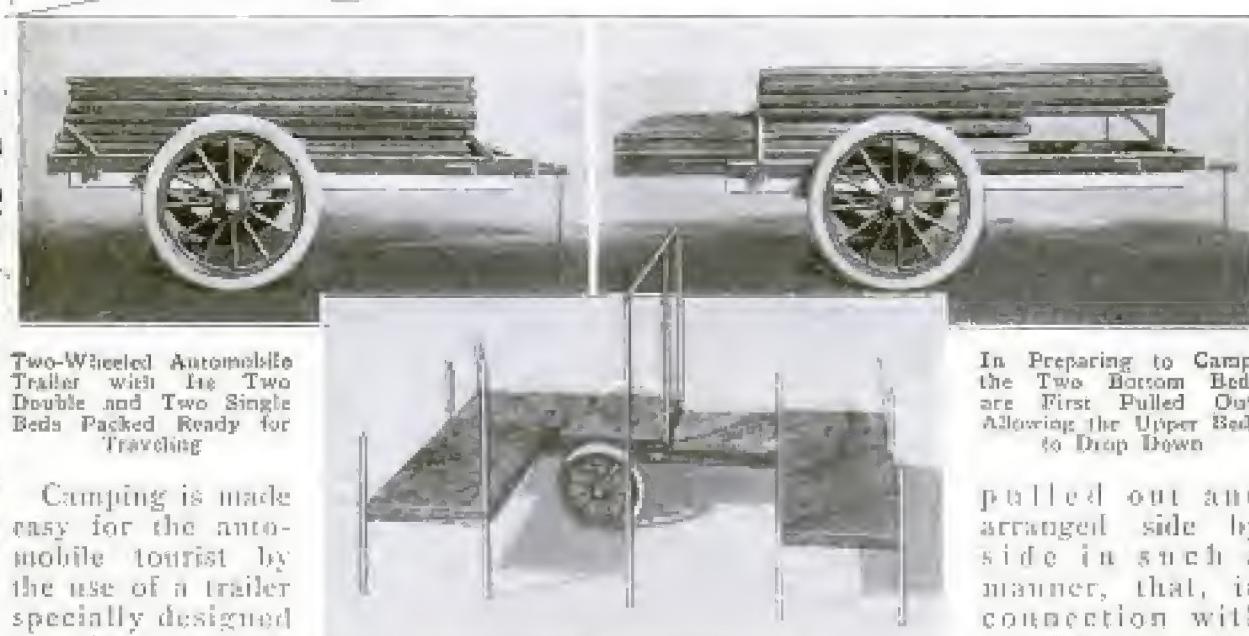


Diagram Illustrating the Principles upon Which the Magnetic Log Washer Operates, and Showing How the Magnetic Materials are Retained and the Nonmagnetic Washed Out

under present mining methods. Now, hematite is very similar to magnetite in composition, except that hematite has a slightly larger percentage of oxygen. Hematite is not magnetic, however. But engineers have shown that hematite may

AUTO TRAILER FOR TOURISTS MAKES CAMPING EASY



Two-Wheeled Automobile Trailer with Its Two Double and Two Single Beds Packed Ready for Traveling

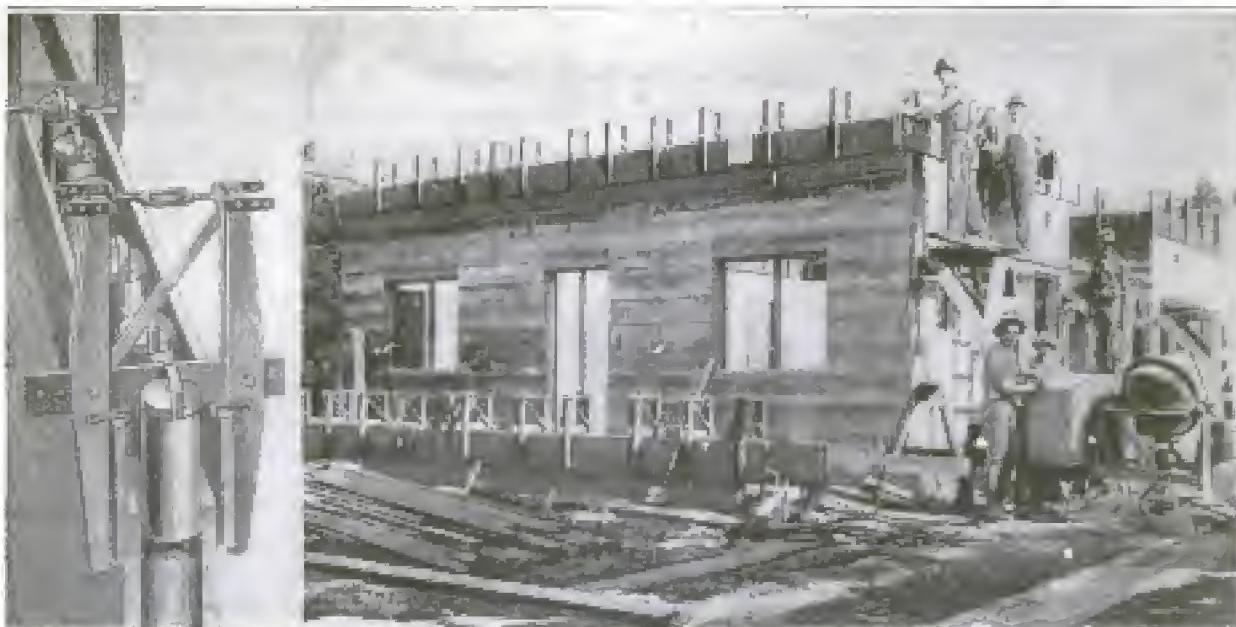
Camping is made easy for the automobile tourist by the use of a trailer specially designed for that purpose. Mounted on two rubber-tired wheels, the frame of the trailer is 7 feet long by 3 feet 10 inches wide and carries, piled one above the other when traveling, two double and two single beds. When camping, these are

The Beds are Shown Ready for Use, with the Head of Each Single Bed Bolted to the Side of a Double Bed.
The Ridgepoles between Them Support the Tent

In Preparing to Camp, the Two Bottom Beds are First Pulled Out, Allowing the Upper Beds to Drop Down

pulled out and arranged side by side in such a manner, that, in connection with steel supporting poles, a canvas tent can be thrown over the whole. When

traveling, this tent is carried on the trailer beneath the beds, and in front of them is a box for a camp stove and cooking utensils.



Forms for Pouring Hollow-Concrete Walls, Which are Built in Courses: At Top of the Finished Part of the Walls, the Forms are Seen Mounted and Ready for Pouring the Next Course; at Left Is an Enlarged View, Showing One Frame and Several Core Members

FORM FOR POURING CONCRETE HOLLOW WALLS IN COURSES

Simple and inexpensive in construction, a form for hollow-concrete walls that is very readily placed in and removed from its operative position has been recently patented. The form is composed of frame members, a series of which are mounted along a finished course of the wall so as to provide means for supporting sideboards extending upward and making a form for pouring the next course. Each frame member consists of a pair of uprights with transverse braces between them that are adjustable so that the sideboards can be supported in suitable position for any thickness of wall. Equally spaced between the sideboards are placed cylindrical core members to form a hollow-wall construction. They are supported in the cored holes of the finished course, and extend upward so as to continue these holes.

271

STORM KING MOUNTAIN ROAD READY FOR AUTO TRAFFIC

A splendid highway skirting the Storm King Mountain on the west bank of the Hudson River is now ready for auto traffic. The road, which necessitated six years of blasting through the rocky ledges of the mountain, shortens the route from Newburgh to New York by about 16 miles. The main section, which lies between West Point and Cornwall, is considered to be one of the most beautiful stretches along the Hudson.

PHOTOGRAPHIC STATUETTES MADE VERY REALISTIC

Recently introduced into this country from Europe is a very interesting method of making photographic statuettes. The subject is photographed in the usual way. The paper print is then cut out, following the exact outline of the figure. This is pasted onto a mahogany board, $\frac{3}{16}$ inch thick, which is cut away to match the photograph. When mounted on a small pedestal, this picture stands out in relief so that it looks like an actual statuette. At a distance it is hard to tell the difference.



Individual "traffic maps," distributed to the 1,500 pupils of the Southside High School in Fort Wayne, Ind., guided them through the building during the first days of the fall term.

N.Y. Times 9/3/22
P. 12. Sect. 1.

W. Alton Lewis Roehne & Monroe Chicago

J. B. Holdcroft,
1785 Fort St.

Engineering news. Read
8/19/22

116 POPULAR MECHANICS
Victoria B.C., Canada
CEMENT FROM RETURNED BAGS
98 58 BUILDS CONCRETE SHED

The possibilities that lie in small savings are again demonstrated by a western

PLAN NATIONAL ENGINEERING
MUSEUM AT WASHINGTON

Under the auspices of the American Society of Mechanical Engineers, the coöperation of engineering societies, alumni associations, engineering schools, and others, is sought in support of a project for the establishment of an engineering museum in connection with the National Museum at Washington. The plan has the support of the Smithsonian Institution. With adequate coöperation, it is expected that there will be established at the national capital an engineering shrine worthy of the profession, and of great educational value. All societies or organizations interested can obtain further information by addressing Joint Committee on the National



This Building was Constructed of Reinforced Concrete, the Cement for Which was Entirely Obtained from Empty Sacks Returned to the Mill of a Western Cement-Manufacturing Company

cement manufacturer. At his plant a concrete building has been erected, using only cement recovered from returned empty bags. A special machine beat the cement out of the sacks, and enough cement was accumulated in this way, in a comparatively short time, to complete the structure. Large users of cement would do well to consider this, and save for themselves not only the cement reclaimed, but also the extra freight on this cement if returned with the bags.

3/8 SINGLE INSTRUMENT IS BOTH SPEED AND FLOW METER

Fitted on the instrument board of an automobile, an ingenious instrument which shows the driver the fuel consumption in miles per gallon, is attracting much attention in England. The instrument has the appearance of an ordinary speedometer, but is a combination of this instrument with a flow meter. It shows the miles per hour in the same manner as a speedometer, while by means of a small moving hand on the dial, actuated by the flow meter, it also shows the miles per gallon. Thus the fuel consumption can be tested for all speeds and all adjustments of ignition and carburetor, and the most economical conditions can be ascertained.

Engineering Museum, A. S. M. E., 29 West 39th St., New York City.

EXTRA WATER MAY BE HEATED
IN UTENSIL COVER

Practical economy in the kitchen is aided by the production of a cooking utensil which includes a hollow cover having a water capacity of 3 quarts. With this appliance, the housewife may boil the meat, vegetables, etc., for the meal and at the same time heat enough



At the Right is Seen the Economical Cooking Utensil, While at the Left Is the Removed Cover Which Holds Three Quarts of Water, That is Heated While Food is Boiled in the Pot

water in the cover to make the tea or coffee, or even to use in washing the dishes.

Mr. Moha J. M. L. H.
Nurnberg, 03
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Germany

11 no. es W. S. Midley, New Holland,
Ohio.



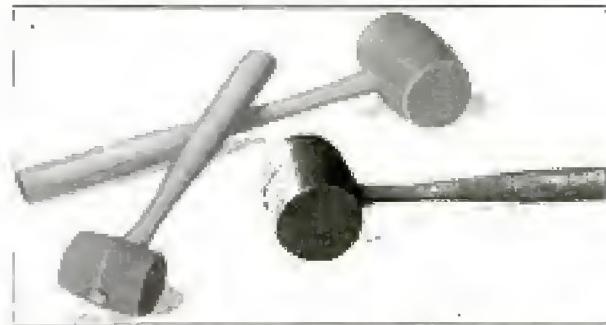
Clod Crusher and Leveler Chained to a Harrow Which is Hauled by the Small Tractor over a Plowed Field: It Crushes the Clods and Leaves the Soil Perfectly Level and Smooth. Three of the Bent Plates Are Sufficient for Most Kinds of Soil, But More can be Added.

260 CLOD CRUSHER AND LEVELER IMPROVED MOTORCYCLE STAND OPERATES WITH A HARROW 2910 SIMPLE AND EASY TO USE

Trailed by a disk harrow which is hauled by a small tractor, a combined clod crusher and leveler, recently constructed in Ohio, consists of a flat rectangular frame to which are attached three or more parallel metal plates partly bent down at an angle of about 45°. Following the harrow over a plowed field, these plates break up the clods, and level the soil much more smoothly than can be done by the harrow alone.

205 RUBBER MALLET FOR AUTO USE SAVES TIRE AND RIM

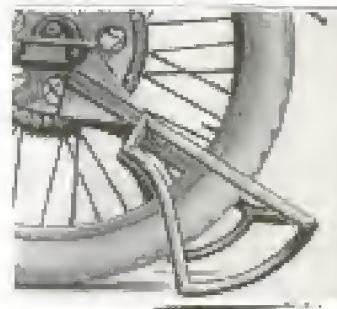
A large manufacturer of rubber goods is introducing a mallet with a rubber head, intended to eliminate the injuries to tires and rims that result from careless or misdirected blows from a metal hammer, when changing tires. The tool ought to save many bruised fingers, and will undoubtedly be appreciated by car owners and repairmen.



These Rubber-Headed Mallets, for Use in Changing Automobile Tires, do Not Injure Tires or Rims.

The W. H. Woodrich Co., Akron, Ohio.

With a new motorcycle stand the lower base is arc-shaped so that, instead of being lifted up and over the brace, the machine need only be pushed backward, whereupon it automatically raises itself and settles into position. The base of the improved stand is held by two arms that join together near the wheel hub.



247 ROOFING MATERIALS TESTED FOR HEAT RADIATION

Recent investigations of roofing materials in relation to their heat-radiating qualities, have been conducted by the U. S. Bureau of Standards. Nearly all material of this kind now available, either has both sides covered with asbestos, or both sides coated with aluminum paint. According to the experiments of the bureau, however, the best radiation results are obtained when only the outside of the roof is covered with asbestos or white paint, and the inside with aluminum paint. Thus it is claimed that tents and other similar inclosures, when exposed to the rays of the sun, can be made more comfortable in hot weather by preparing the roofs in that manner.

Bureau of Standards
Dept. of Commerce

Printed in America
Chicago

2910

R. P. Valtier,

Rec.

64

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67



Thirty-Eight Years of Cooperation have Made Possible This Gathering of North Dakota Farmers at the Farm of One of the Members of the Group Who Are Successful Breeders of Dairy Cattle

COOPERATIVE CATTLE BREEDING IN NORTH DAKOTA

BY ALLEN P. CHILD, *Boyer '76, Statist E.*
Roman City, Mo.

MANY years ago an Indian stood watching one of the pioneer settlers of North Dakota as he plowed a field. After the farmer had completed a few

By retaining the prairie-grass pastures of the district around New Salem, 17 men, by their coöperative efforts, have established an enviable record in the raising of pure-bred dairy cattle. In 1906, one man bought a carload of such cattle for sale among his neighbors, and no individual took more than one head. In 1921, this same group owned 251 pure-bred cows. Together they bought 10 silos and let a contract to a local concrete contractor for the foundations. Later they invested in eight milking machines. For 20 years they have maintained a



A Family from a Herd of Plains-Bred Cows Accustomed to Taking Their Living by Grazing on the Native Grass of the Prairie, of Which Eight Acres are Required to Support One Cow

furrows, the Indian stopped him, and bending over, turned back a piece of the freshly plowed sod, remarking simply, "Wrong side up." In a certain sense the Indian was correct, for hundreds of North Dakota farmers have found that wealth comes to those who plow not, but who maintain large herds of dairy cattle.

mutual fire-insurance company. Their threshing is done in nine-men rings, and the silage cutting in five-men rings, the machines being jointly owned, manned, and operated. Four members who are neighbors use a section of pasture land together without cross fences, and have done so for 10 years. And so the effect



An Indian's Laconic Remark Led to the Foundation of North Dakota's Most Prosperous Dairying District, Where the Farmers Gave Up Plowing the Soil and Now Maintain Large Herds on the Prairie-Grass Pasture

Dno. Walter E. Louche,
1023 Arang, New Mex.

South Pasadena, Calif.

oi coöperating in securing pure-bred cattle has led them to apply the same principle in manifold ways to obtain the very most out of their farms.

A superintendent is employed who tests the cows of the members regularly, and helps them to keep feed-cost records. The members advertise their cattle as a unit, and show at fairs as a unit. Whenever a pure-bred animal is sold, five per cent of the sale price is put into the joint treasury to be used for promotion purposes. 9695 —

DESIGN KNOCKDOWN DECKING FOR SHIPPING AUTOS.

Because of the great waste of lumber used for decking automobiles for shipment, a collapsible decking that can be used over and over has been patented. The supporting frame is made of castings and steel tubing, and castings are provided for bolting the frame to the car floor. The autos are supported on the hubs or axles, and rest on replaceable wooden blocks. When in position, they are securely held by lugs that fasten to



This Auto Decking, of Steel Tubing and Castings, Holds the Cars Securely and can be Folded and Returned to the Factory When Cars have been Delivered

the floor or the frame. When the cars reach their destination, the frames are removed, folded up, and returned to the factory. 224 —

OLD-FASHIONED WINDMILL STILL IN OPERATION

A relic of primitive flour-milling methods is a large windmill standing conspicuously on an island in Lake Vänern, Sweden. The main shaft, driven by the wings, is cut from one piece of wood and is 14 inches square. This drives, through wooden gears, a vertical shaft, also of wood, on which are mounted the millstones for grinding the grain. In these

days of power-driven rolling mills, such survivals of the kind of flour mill that



Old Windmill on an Island in Lake Vänern, Sweden:
The Mill is Built Entirely of Wood, Including Its Driving Shafts and Gears

was once universal are interesting if not very useful.

SALESMAN OPENS OFFICE

23 | IN LARGE OIL TANK

Having his office in an oil tank of the type he is selling, is the scheme employed by a California tank salesman to interest buyers. A hinged strip cut from one of the plates serves as an entrance, while an opened intake cap is used as a window. The office occupies a corner lot in a residential district.



Appropriate Office of an Oil-Tank Salesman in a California Town

Encl. W. A. Schenck 50% Van New Mex.
Los Angeles, Calif.

Encl. W. A. Schenck 50% Van New Mex.
Los Angeles, Calif.

Sibyllegatan 39
Stockholm-Sweden

Carl Rosgi M. Hillefors
Stockholm-Sweden Cable

Engracted - W. J. Jingley
of Cleveland, Maine

W. W. & Mr. Adam Reger, 439 St. Luke St.

228 POPULAR MECHANICS

BRACKETLESS BANJO HEADS ADJUSTED WITH ONE KEY

A recent improvement in banjos, mandolins, and similar instruments does away with the old method of tightening the



Banjo with Bracketless Head That is Adjusted Always Evenly, by Means of a Key Inserted in a Lock in the Center of the Back, as Seen Above

head by means of brackets, a method that often led to unequal tightening of the head, one side being perhaps too tight and the other side too loose. This is impossible in the new method, which adjusts the tension on the head suitably by the action of a key that is inserted in a lock at the center of the back of the banjo. With this key the adjustment is made in a second, and cannot be otherwise than perfectly uniform.

CHIMNEY MOVED TO NEW SITE EIGHT FEET DISTANT

206 A brick chimney, 88 feet high and weighing 120 tons, stood on the site selected for a new building at Portland, Me., and it was a question of either building around the chimney, tearing it down and rebuilding it, or else moving it bodily. The latter plan was adopted, and



Left: Showing How One Man Operated a Jack to Move a 120-Ton Brick Chimney before being Moved to the New Foundation. Right: Note Steel Rails Which Served as a Track



a concrete bed was laid for the track, on which steel rollers carried the stack to its new base, about 8 feet away. The actual moving was done by one man with a jack, and was accomplished in three hours, although several weeks were consumed in preparation and in securing the stack to its new foundation.

CULTIVATION OF DAISIES A PAYING ENTERPRISE

218 The common white daisy which, when growing wild, is so irrepressible that it is regarded as a pest by the average farmer, has been converted by Luther Burbank, the plant wizard, into a nosegay popular with city dwellers. Burbank developed from the common stock a large beautiful blossom, called the "Maximum" daisy, and an agriculturist in Alabama conceived the idea of cultivating this plant, and selling the cut flowers to city florists. The enterprise has turned out to be quite profitable, and thousands of blooms were first sold in southern cities.



Field under Cultivation with the "Maximum" Daisy Developed from the Common White Daisy by Luther Burbank: The Blooms are Shipped to City Florists

Recently blooms were sent to New York, where they arrived in good condition.



Intake End of Large French Wind Tunnel, Used for Testing Airplane Models: Note the Size of the Tunnel in Comparison with the Man Standing near the Base. It Is Nearly 100 Feet in Length and is Constructed of Reinforced Concrete

LARGE FRENCH WIND TUNNEL TESTS AIRPLANE MODELS

The French air service has built a large air tunnel to be used as a test chamber for miniature airplanes and models of parts of airplane structure. It is constructed of reinforced concrete and has an outlet resembling a huge phonograph horn, the mouth of which is 26 feet in diameter, while the tunnel is 10 feet inside diameter and nearly 100 feet long. The air current is created by an electric motor-driven fan of 1,000 horsepower, and can be maintained at a velocity of 185 miles per hour in the test chamber. The unusual dimensions of the tunnel and the high velocity of the air stream are the features of this installation, which is otherwise of standard type.

Red, white, and blue-blossomed clematis have been trained by a Washington woman so that, when in full bloom, the effect is an accurate reproduction of the American flag.

NON-SINKABLE BATHING SUIT FOR TIMID SWIMMERS

Timid persons who lack a full measure of self-confidence while bathing, may now reinforce themselves in this respect by wearing non-sinkable suits. The garments are made of wool, knitted in the usual way, and have rubber tubes sowed on the inner side, which are inflated with air before the wearer enters the water. The tubes are incorporated in such a manner as to be hardly noticeable, and the outfit can be worn as an ordinary bathing suit when the air is released from the interior.



Knickerbocker Knitting Mills, 1389 W. 6th St., Cleveland, Ohio
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POPULAR MECHANICS

Manchester Guardian
Commercial 7/20/22**CONSTRUCT MAMMOTH BARREL AS REFRESHMENT STAND**

Built in the form of a huge barrel, a refreshment stand attracts considerable



Refreshment Stand Which was Built in the Shape of a Mammoth Barrel, Showing the Display Windows, Door, and Appropriate Name

attention from the motorists passing along the highway near which it is located. The odd-appearing structure is 20 feet in height, 14 feet in width, and consists of two stories or floors. The ground floor contains the display shelves, ice box, etc., while the upper portion is used as a storehouse for stocks of the goods on sale below.

AIR-MAIL SERVICE GOES YEAR WITHOUT FATAL ACCIDENT

Not a single fatal accident in the air-mail service of the Post Office Department, is the record for the year ended July 16, which proves more conclusively than any other test the reliability and efficiency of the airplane. Flying daily in every kind of weather, the mail planes covered 1,750,000 miles on the New York to San Francisco route, and during that

Aviation 7/31/22

time transported more than 49,000,000 letters, totaling 1,224,500 pounds. This outstanding record is attributed mainly to the experienced pilots who are now familiar with their routes, although it is felt that the abandoning of metal monoplanes, in which a number of fatalities occurred last year, has been a factor.

181

CARBON DIOXIDE SOFTENS BOILER SCALE

Investigations undertaken at the Mellon Institute of Industrial Research indicate that carbon dioxide is a solvent for the hard scale formed in boilers by some waters, and that it is an easy matter for the power-plant engineer to determine whether scale is susceptible to this treatment by a simple laboratory experiment. A few pieces of scale chipped from inside of the boiler can be placed in a stout bottle or other closed container, so as to be just covered with water, and carbon dioxide admitted from ordinary carbonating equipment, such as used in soda fountains. It should then be left under a pressure of 30 to 50 pounds per square inch, and the results observed at the end of four or five days.

127

PEG FOR STRINGS OF BANJOS AND OTHER INSTRUMENTS

For holding and tuning the strings of any instrument, but especially of the banjo, a transmission peg that prevents the strings from getting out of tune has recently been patented. The peg is screwed to the face of the head of the instrument, and is operated by turning a small handle, the spindle of which is geared to the peg. It takes three turns of this handle to make one turn of the peg, thus making possible very delicate adjustments.



Transmission Peg for Banjos and Other Stringed Instruments: To Get a Higher or Lower Pitch on a String, the Small Handle is Turned Suitably

William Page
225 E. 24 St. New York City
Copyright 1922 by Popular Mechanics Co.

SPECTACULAR REPAIR TASK OF LINE FOREMAN

Spectacular in the extreme, describes the task recently performed by a line foreman in repairing a high-tension transmission cable strung across the Straits of Carquinez, in California. These cables carry 110,000 volts and are 135 feet above the water, but despite this great height, a sailing vessel with an unusually high mast, drew down a lightninglike arc from one of the conductors and practically ruined it. To repair the

67

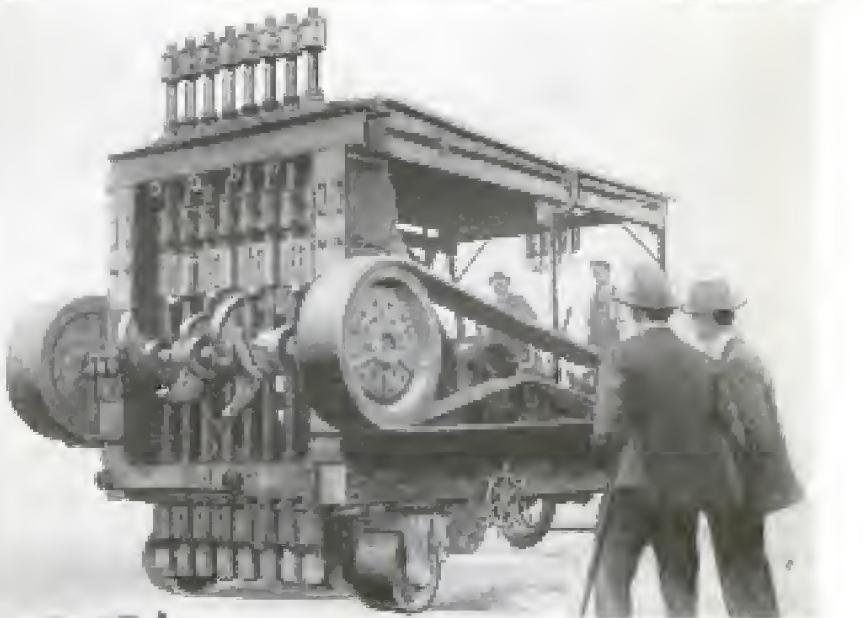


Copyright, Underwood & Underwood
Little Car In Which "Pete" Lindsay, the Fearless Line Foreman, Coolly Trolleyed Out upon the Damaged High-Tension Transmission Cable to Make the Necessary Repairs

trouble required the trolleying out upon the burned and weakened cable in a small car and working, literally, in mid-air. It being obvious that the undertaking was a precarious one, a volunteer was asked for. The foreman of the line crew immediately responded and, with groups of awed fellow workmen and spectators anxiously watching him, coolly pulled the little car out upon the swaying cable and repaired the damage.

CONCRETE-SURFACE CRUSHER FOR ROAD REPAIR

For use in concrete-road repair work a surface-crushing machine has been patented in Great Britain. Mounted on wheels, a strong steel frame supports a battery of eight drop hammers in front of it. These are operated in pairs by rotating cams driven by heavy flywheel pulleys and belts, in connection with a motor at the rear of the machine. With the drop hammers in operation, the machine is moved slowly along the road, and its concrete surface is broken up wherever necessary in repair work. At the end of each hammer is a chisel-shaped cutting tool, which can be removed.



I.F.D.
Concrete-Surface Crusher for Use in Road-Repair Work: The Eight Drop Hammers are Driven in Pairs by a Motor in the Rear Part of the Machine. On the Bottom End of Each Hammer Is a Chisel-Shaped Cutting Tool Which can be Removed and Replaced

*No information as to
inventor or maker*

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135 Akron-Selle Co., Akron, Ohio

POPULAR MECHANICS

Built by above. To order for owner.



"Bungalow" on Motor-Truck Chassis That was Constructed for a Wealthy Ohio Man, and in Which He is Now Making a 2,000-Mile Tour of the Eastern States, Accompanied by Three Guests

LARGE PIPE ON BICYCLE ADVERTISES SHOP

128 A new adaptation of old-world trade symbols is seen in the appearance of a large pipe mounted on the delivery bicycle of a pipe shop. The pipe is about 5 feet long, with its bowl resting upon



The Pipe on the Delivery Bicycle Shown Above Advertises the Shop, and in Addition Is Useful for Carrying Supplies

the rear axle and its stem over the handle-bars. It has not only proved an effective means of advertisement but is found useful as well, as the bowl can be filled with smokers' supplies when the regular wire basket is overloaded.

"BUNGALOW" ON MOTOR TRUCK HOUSES FOUR TOURISTS

129 Luxuriousness in motor travel has been exemplified in the building of a veritable "bungalow on wheels," which is now being driven on a 2,000-mile tour of eastern

mountains and lakes. The body, which contains a completely outfitted kitchen, living room, and bedroom, is constructed on a special chassis, being 27 feet long, 10½ feet high, and weighing 12,000 pounds. In the kitchen is running water in an aluminum sink; four bunks with full-length windows opposite each are in the bedroom, while the living room has cushioned seats, a collapsible table, a phonograph, and a radio set with a loud speaker.

59 COTTON REPLACED BY HEMP IN IMPROVED CORD TIRE

For the cotton generally used in cord tires, Bahama hemp is substituted in an improved pneumatic tire recently patented. This should naturally make the tire stronger.

Other improvements consist of an inside rubber lining, which, in conjunction with a rubber interlocking device where the tire engages the wheel rim, make an inner tube unnecessary, as the tire casing is air-tight. Inside the lining, above the tread and the full width of it, is a layer of asbestos cement which is flexible and has a tendency to keep the tube cool.



Clara F. Reasoner
+ W. J. Hunter
Royal High Fiber Tire Co.

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**AUTOISTS TRAVEL 6,000 MILES
ACROSS EMPTY CONTINENT**

Not long ago an expedition of three motor cars completed a successful 6,000-mile trip across central Australia, from Adelaide on the south coast to Port Darwin on the north and back, in 67 days. Experienced travelers and scientists in the party were amazed to find thousands of acres of fertile and well-watered soil and vast grazing plains in this unsettled country. They passed through miles of country without sign of man or beast, and saw great stretches of land with many rivers available for irrigation purposes, the development of which is dependent upon the building of a north and south transcontinental railroad and the introduction of settlers.

146

**LINEMEN BALKAED BY TREE
CUT THROUGH FOLIAGE**

Unable to secure permission to fell a magnificent maple which stood directly in the way, and considering it inadvisable to attempt going above, below, or around it, telephone linemen working near Bloomington, Ill., finally conceived the idea of cutting through the foliage. With the owner's consent enough of the smaller branches and foliage was removed to form a circular opening near the center of the tree. While the "operation," it is claimed, will have no effect on the vitality of the tree, it has given it a most unusual appearance.



The Opening Shown in the Maple Tree Above was Made by Telephone Linemen Working near Bloomington, Illinois, after Vain Attempts to Secure Permission to Fell It

*Encl. E. E. Pierson
Bloomington, Ill.*

**MOVING-PICTURE PROJECTOR
FOR SCHOOLS AND HOMES**

A moving-picture projector that can be used by anybody anywhere, making possible the projection of moving pictures under all conditions, is



Pedal-Driven Moving-Picture Projector Which Generates Its Own Electricity: The Large Pulley Drives the Dynamo and Film Reel

in use in France. The lantern and film reels of the projector are supported above an upright triangular frame, at right angles to which is a second triangular frame supporting a seat and a large pulley driven by pedals. The frames are made of polished oak and are very rigid. Behind the large pulley is a dynamo which supplies current for a high-powered incandescent lamp. By means of belts the pedaled pulley operates the dynamo, the projector, and the film reels all simultaneously. Films used in moving-picture theaters, or special educational films, can be thrown on a screen about 5 feet wide, large enough for most schools or homes.

When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.

Received, some des Alouettes, Garde, France.

IMPROVED DEVICE SPEEDS UP HANDLING OF MAIL

A new machine designed by the staff of the mail-equipment shops of the Post

Office Department, will greatly facilitate the work and effect a saving of about \$2,000 over each of the older units which it will supersede for systematically arranging letters preparatory to cancellation. This so-called "pick-up" or "facing" table is operated by a $\frac{1}{2}$ or 1-horsepower motor, and has a stationary circular top with a revolving under platform surrounded by two circular slots which provide facilities for both large and small envelopes. Eight men can stand around the table and deposit letters in the slots, which revolve eight times a minute and stack the envelopes into packages.



Copyright, Harris & Ewing
This "Pick-Up" Table will be Used in the Larger Post Offices to Speed Up Cancellation of Letters. Eight Men Sorting Out the Large and Small Envelopes can Work around It



MODELS OF VARIOUS BOATS USED BY SOUTH SEA ISLANDERS

THE result of 25 years' effort by a resident of Canada is a curious collection of models of the many varied types of boats used by South Sea islanders. Among the models, all of which were made by natives, are a New Guinea war canoe with its fighting bridge, on which archers stand, between its sails; double canoes from Tongareva Island; canoes decorated with seashells from Savage Islands, and examples of nearly every kind of craft from the New Hebrides, from Samoa, and from many other islands of the Pacific. There is also, at the extreme right, a model of the pearl-fishing canoes, used by the natives of Ceylon, and so similar to the South Sea islanders' craft as to offer an interesting comparison.

Capt. Francis Michie, Merton,
B.C., Canada

address 66 1st Ave. Eugene T. O'Neill
POPULAR MECHANICS
of Lester Dargent, 524 1st St. Minneapolis.

727



One of the New "Listening Counters" Which have been Recently Introduced for Use in Music Stores and at Which the Prospective Buyer may Sit and Hear the Phonograph Records, Thus Enabling the Store Proprietor to Economize Space by Doing Away with the Customary Booths

166
**PHONOGRAPH RECORDS CHOSEN
BY USE OF EAR TUBES**

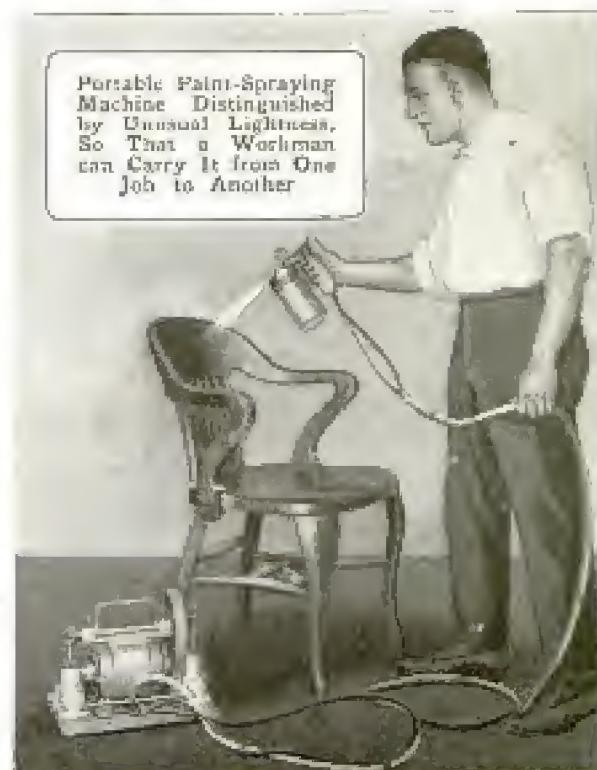
"Listening counters" are innovations for music stores, to economize space by doing away with the booths in which the prospective customers play phonograph records before making their selections. The counters have a series of compartments, each containing a talking machine, the tone arms of these being connected to rubber tubes which the buyers place to their ears, thus enabling them to hear the melody without interference from the adjoining machines.

97

**NEW PAINT-SPRAYING MACHINE
LIGHT AND COMPACT**

A portable paint-spraying outfit, recently placed on the market, is distinguished by its compactness and lightness, weighing, with its carrying case, only about 28 pounds, so that a workman can take it along to any job where there are facilities for running it. Its air compressor is driven by an electric motor which consumes about as much current as a 40-watt lamp. The compression cylinders,

which are arranged one at either end of the motor, have fins like those of an air-cooled engine.



Universal Sprayer Co,
90 W. Broadway
New York City
Copyright 1927 by Popular Mechanics Magazine

Mess. Oscilloscope Syndicate, Ltd.
728 47 VICTORIA ST. WESTMINSTER
London, S.W. England

1916 **OSCILLOSCOPE ALLOWS STUDY
OF HIGH-SPEED MACHINES**

High-speed machinery can be studied at .01 of its actual velocity with the aid



106
Electrical Oscilloscope Which Enables High-Speed Machinery to be Studied at a Rate of Only One-Hundredth of Its Actual Velocity

of an oscilloscope which is now being produced in portable units by an English company. The outfit consists of a small storage battery, two specially designed electric lamps and reflectors, and a spec-

ial switch, or contact breaker. Extension cords are provided for the lamps and contact so that they can be moved freely about while connected to the battery. In operation, the machine to be studied is placed in a darkened enclosure, and to its shaft a cam, or wheel, is geared at a 100-to-101 ratio, or 1 per cent slower than the machine shaft. The contact is then fastened to the cam, and at every revolution switches on the brilliant lamps for just an instant. The observer, of course, only sees the machine while it is illuminated, but if the shaft is turned fast enough, these illuminations, appearing .01 of a revolution apart each time, blend together. Thus the observer can see the entire revolution of the machine shaft at only .01 of its original speed, giving ample time to perceive any defects or peculiarities which would lower the efficiency of the machine.

106

**ELECTRIC BLOWER FAN USED
TO CURE HAY**

Curing stacks of hay with an electric blower fan outfit, is the method employed by an English farmer-scientist, which enables him to treat his large crops without having to depend upon the sun's assistance. The grass is stacked as quickly as it can be hauled to the selected spot, the stacks being built in the usual manner but having in their centers an air chamber to which the fan is connected. The excessive heating, due to the action of the fermentation bacteria, is kept within safe limits by intermittent blowing, thermometers being used to observe the temperatures of the different stacks.



106
International
Left: Haystacks Being Cured by an Air Blast from a Powerful Blower Fan Driven by an Electric Motor.
Right: Taking the Temperature of a Haystack with a Thermometer Fastened to the End of a Stiff Wire

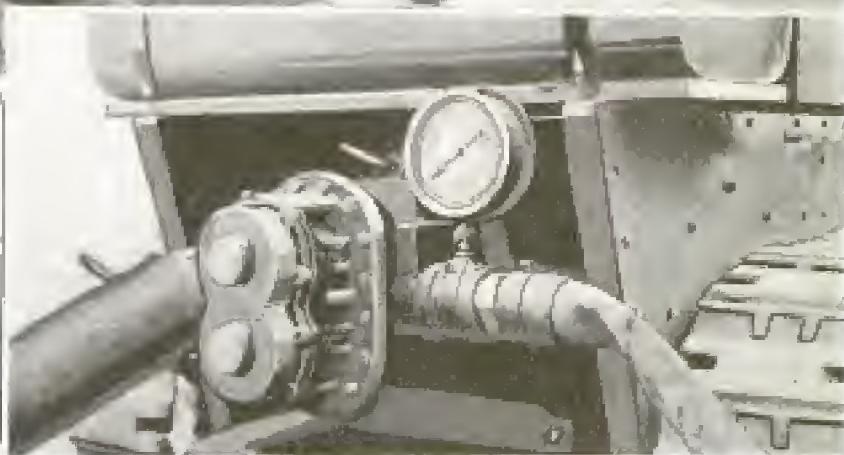


Seneca Falls, N.Y.

Ele.
Use
Art

Mr.

Above: Stream of Water from a Hose Held by Three Men, Thrown by a Rotary Pump Attached to a Tractor and Driven from the Tractor Engine. Below: Close-Up, Showing the Small Rotary Pump, Totally Inclosed and Weighing but 225 Pounds, Which Has a Capacity of 220 Gallons of Water per Minute at 100 Pounds' Pressure per Square Inch, Throwing a Stream from a 1½-Inch Nozzle 100 Feet in the Air.



133 ROTARY PUMP HAS MANY USES APPLIED TO TRACTOR

A rotary pump, specially built with reference to its adaptation to tractors, offers interesting possibilities of practical value. The pump is designed with all working parts inclosed, so that the load is taken by driving gears with no metal contact between the blades, and with a positive jaw clutch for disconnecting from the power. It has a capacity of 220 gallons of water per minute at 100 pounds' pressure, and will throw a 1½-inch stream 100 feet in the air, requiring 26 horsepower. It will be useful in forest-patrol, municipal fire service, irrigation, and for contractors' work.

136

APPLAUSE FROM AN AUDIENCE ARTIFICIALLY STIMULATED

Any hesitation of an audience to start applause, and to continue it with increasing volume when once started, is dispelled by a very simple means of stimulating applause now in use in a theater in Ha-

vanna, Cuba. Each member of the audience is furnished with a piece of hardwood, about 2 inches by 3 inches in size and $\frac{1}{4}$ inch thick, together with a small wooden mallet. With these in their hands the temptation is strong to use them, and the custom has been for the applauders to keep time with the music.



Applause Stimulator Seen in Operation in the Hands of the Member of the Audience in the Foreground. The Device, as Shown in the Inset, Consists of a Small Piece of Hardwood and a Mallet.

Russell Raymond Dooshee
General Delivery, Miami, Fla.

Brooklyn, N.Y.
FLOWER-DISPLAY HOLDER

142 FITS ANY-SIZE POT



Flower-Display Holder, Showing the Stand and Pot Holder; Also How Potted Plants may be Exhibited

Flowerpots of any size may be placed in an adjustable display holder for use in florists' shops, at weddings and receptions, for window trimming, and the like. The holder permits the potted plant to be exhibited at various angles, or in an upright position, or even to be whirled around on the stand without danger of being thrown out. The fixtures, being made of brass, are practically indestructible, and are so constructed that the metal framework can be easily wrapped or draped if a further decorative effect is desired. When watered, the "drip" is caught in a small basin at the base of the holder, whence it may be drained away by the removal of a cork from the underside of the small catch basin.

189 AUTO SPEEDWAY BUILT UNDER DIFFICULTIES

The construction of the new speedway at Kansas City, Mo., presented unusual difficulties, owing to the fact that the city and vicinity are hilly, making it impossible to locate the speedway, which was to cover 192 acres, on a level site, and to the brief time limit imposed by the scheduled opening for the first race. Added to this, water was encountered five feet below the surface over most of the area. A large hill had to be cut away, and a ravine, through which ran a creek, was converted

These tunnels, of steel and concrete, form a bridge 125 feet long and 90 feet wide, and are tiled to reduce the seepage of the water which collects in sumps, from which it is emptied by automatic pumps with a capacity of 480 gallons per minute.

The oval track is a mile and a quarter in circumference, 50 feet wide, and is banked from 7° on the stretches to 40° on the curves, where it reaches a height of 25 feet. The track is built entirely of yellow pine, 4,000,000 feet being required, and is calculated to be the fastest in the world, with a safe speed of 120 miles per hour. The grand stand and bleachers, of steel construction and each with a seating capacity of 17,000, are located on opposite sides of the track, and each was completed in 7 days by a force of 500 men working on one shift. A 40-foot safety zone with 8-inch creosoted-oak posts protects the spectators. A 1-mile dirt track is within the speedway for horse racing, and the infield provides parking space for about 5,000 automobiles from which the racing can be viewed, while 17,000 more can be parked outside the speedway track but within the inclosure.



Bridging a Ravine Where a Concrete Structure will Carry the Speedway Tracks for a Distance of 125 Feet and Form One of the Tunnels Leading to the Infield

into one of the tunnels from the outside, underneath the tracks to the infield, the creek being diverted for this purpose.



Above: Excavation for One of the Main Tunnels under the Track to the Infield. Center: Plan of



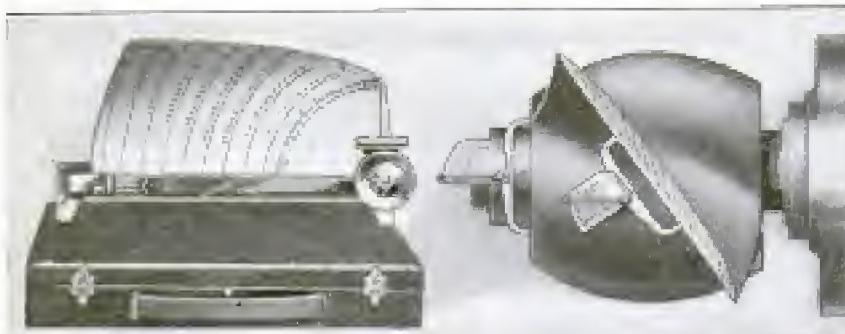
Large Automobile Speedway. Below: Large Steel Grand Stand Erected in Seven Days



INSTRUMENT INDICATES PITCH OF PROPELLER

An English dealer is advertising a small portable device for measuring the pitch of screw propellers, according to the fol-

level is centered in its tube, keeping the shifting arm at the bottom of the index plate, while the two feet of the instrument are held against the boss or nut of the propeller; next the instrument is transferred to the blade of the propeller so that the feet will rest on the first radial line, and the arm shifted, without interfering with the level, until the bubble is centered. The pitch can then be read at the point where the top of the arm crosses the arc marked "2 feet" on the index plate. The pitch at the other radial lines is found in a similar manner.



Left: Close-Up of Instrument for Measuring Pitch of Screw Propeller. Right: Instrument Shown in the Two Positions Required to Measure Pitch

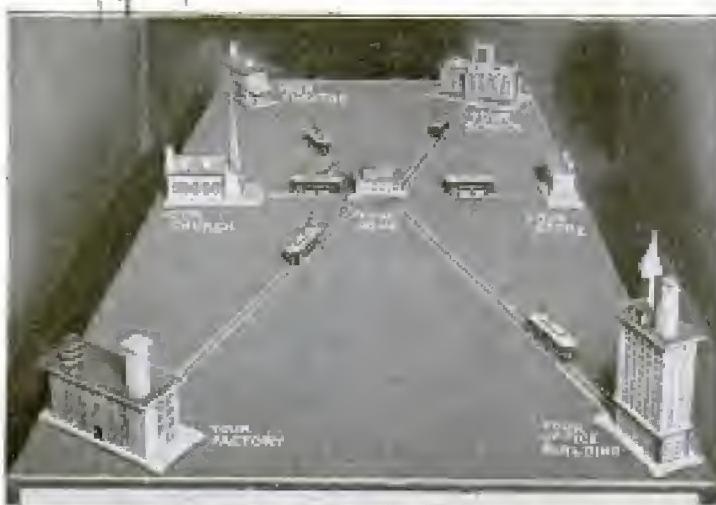
lowing method: First, radii are drawn on the blade at 2-foot intervals from the center of the boss; then the bubble of the

STORM WRECKS LUMBER BARGE, CARGO STREWN ON BEACH

Wreckage similar to that usually left in the path of a tornado, was strewn along a mile of beach at the mouth of the Umpqua River, in Oregon, recently, when the large lumber barge "Wash-tucna" was driven onto a sand spit by a severe storm. The high winds and waves that proved so disastrous to the heavily loaded craft, dashed the lumber around with such force that it was rendered commercially worthless. Some 800,000 feet of the product still remain in the hold of the barge, and plans are being considered to bring this safely ashore.



Splintered and Broken Cargo Washed Up on the Beach When the Heavily Loaded Lumber Barge "Wash-tucna" was Wrecked off the Oregon Coast Recently



This Exhibition, Demonstrating the Benefits of Street Railways, was Displayed at a Better-Homes Show in Baltimore

BENEFIT OF STREET CARS SHOWN IN BALTIMORE BY MODEL RAILWAY

The benefit of street railways was demonstrated in an interesting manner at a better-homes show recently held in Baltimore. A model home was built in the center of an oblong platform, and railway lines with small cars running on them were shown radiating in six directions to other miniature houses representing an office building, a factory, a theater, church, school, and store. The table was built by a local traction company.

Civil. A. S. Burroughs 3809 Park
Dugliss Ave. Baltimore Md.

Copyrighted material

9892 The Inventor, 224-11th Ave E,
Duluth, Minn.

POPULAR MECHANICS

733



Famous Aerial Bridge at Duluth, Minnesota, Which It Is Contemplated to Replace with a Tunnel. It Spans a Ship Canal across Minnesota Point. The Bridge Is 400 Feet Long, and the Traveling Carriage Suspended from Supports (Unseen in the View) That Are 186 Feet above the Water

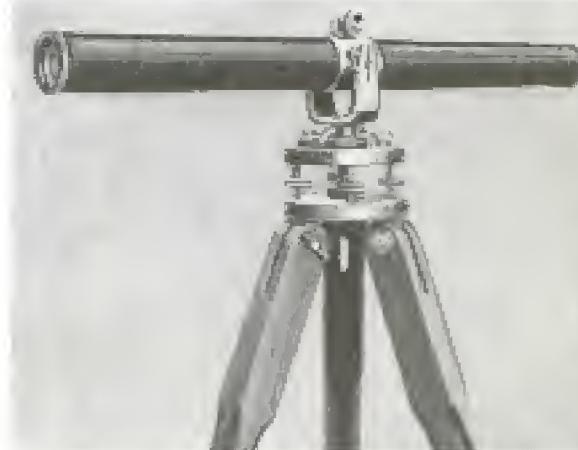
9892
**TUNNEL PLANNED TO REPLACE
AERIAL BRIDGE AT DULUTH**

Construction of a tunnel to replace the well-known aerial bridge at Duluth, Minn., is under consideration by the city council. The bridge is getting old and becoming unsafe. Not long ago the traveling carriage failed to work, and remained fixed over the channel right in the course of an approaching steamship, causing a panic. The bridge spans a ship canal across Minnesota Point, where there is heavy automobile traffic, particularly in the summer. The proposed tunnel would provide street-car service, and would also facilitate the automobile traffic, which is now handled so slowly by the aerial bridge.

9892
**ACCURATE METHOD OF TIMING
AIRPLANE SPEED**

The essential feature of a new method of timing the speed of an airplane over a measured distance, is a transit instrument consisting of a telescopic line of sight with cross hairs, and having vertical and horizontal adjustability. The outer horizontal circle carries a movable arm that can be clamped and is designed to make electrical contact with a collar on the spindle, thereby energizing a magnet

which controls the starting of a stop watch. In making the observation, two instruments are used, each set up at right angles to opposite ends of the measured



Transit Instruments, Two of Which are Used in Connection with Stop Watch and Electric Circuit for Timing Airplane Speed

course, the first one being adjusted to start the watch as the plane crosses the line of sight and the second to stop the watch as the plane passes its line of sight.

A preparation in liquid form, which when applied to a "run" in silk hose prevents further raveling until the fabric can be mended, is now on the market.

Cmd. Ralph H. Heacock,

22 E. Haddon Ave. Akron, N.Y.

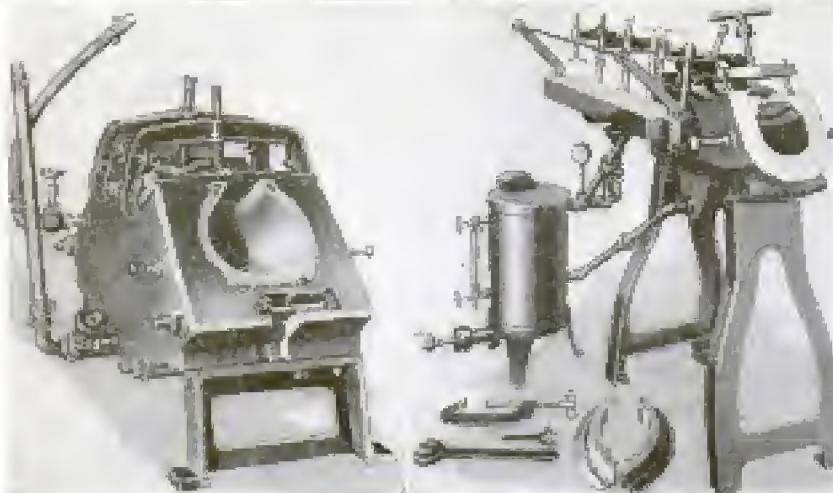
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Franklin St., Brooklyn, N.Y.
Hancock, Ltd.

ADJUSTABLE MOLD FOR TIRES OF ANY SIZE



Left: Single-Cavity Mold Which Is Adjustable to Accommodate Truck Tires Ranging from Five to Nine Inches. Right: Single-Cavity Mold That can be Adjusted to Fit All Sizes of Passenger-Car Tires

Adjustability to within a fraction of an inch, both laterally and perpendicularly, so that all sizes of cord or fabric tires can be perfectly fitted, is the outstanding feature of a new vulcanizing mold. The mold is constructed in halves, held together by bolts, and can be made to fit any standard tire by the use of spacers between the halves for the larger tires, and reducing shells for the smaller. The equipment saves first cost, fuel, and space.

9957

AUTOMOBILE MOTORS USED IN PUMPING OUTFITS

In specially constructed frames, mounted on wheels, standard motor-car power plants, including radiators and hoods, have been installed in connection with

are provided. Two sizes are in use, one with a light automobile engine and a centrifugal pump that delivers 450 gallons of water per minute with a 12-foot suction lift. The larger outfit has a powerful truck motor, and a centrifugal pump with a capacity of 900 gallons per minute. Two of the smaller units have been in use for about five months, operating continuously from 8 to 10 hours a day.



The Smaller of Two Sizes of Portable Pumping Outfits Seen at Work at the West Side Station of the Denver Municipal Water Plant

portable pumping outfits in use by the Denver municipal water plant. The motors are at one end of the framed carriage, and their shafts are direct-connected with flexible couplings to the shafts of centrifugal pumps mounted at the other end. Priming pumps and other accessories

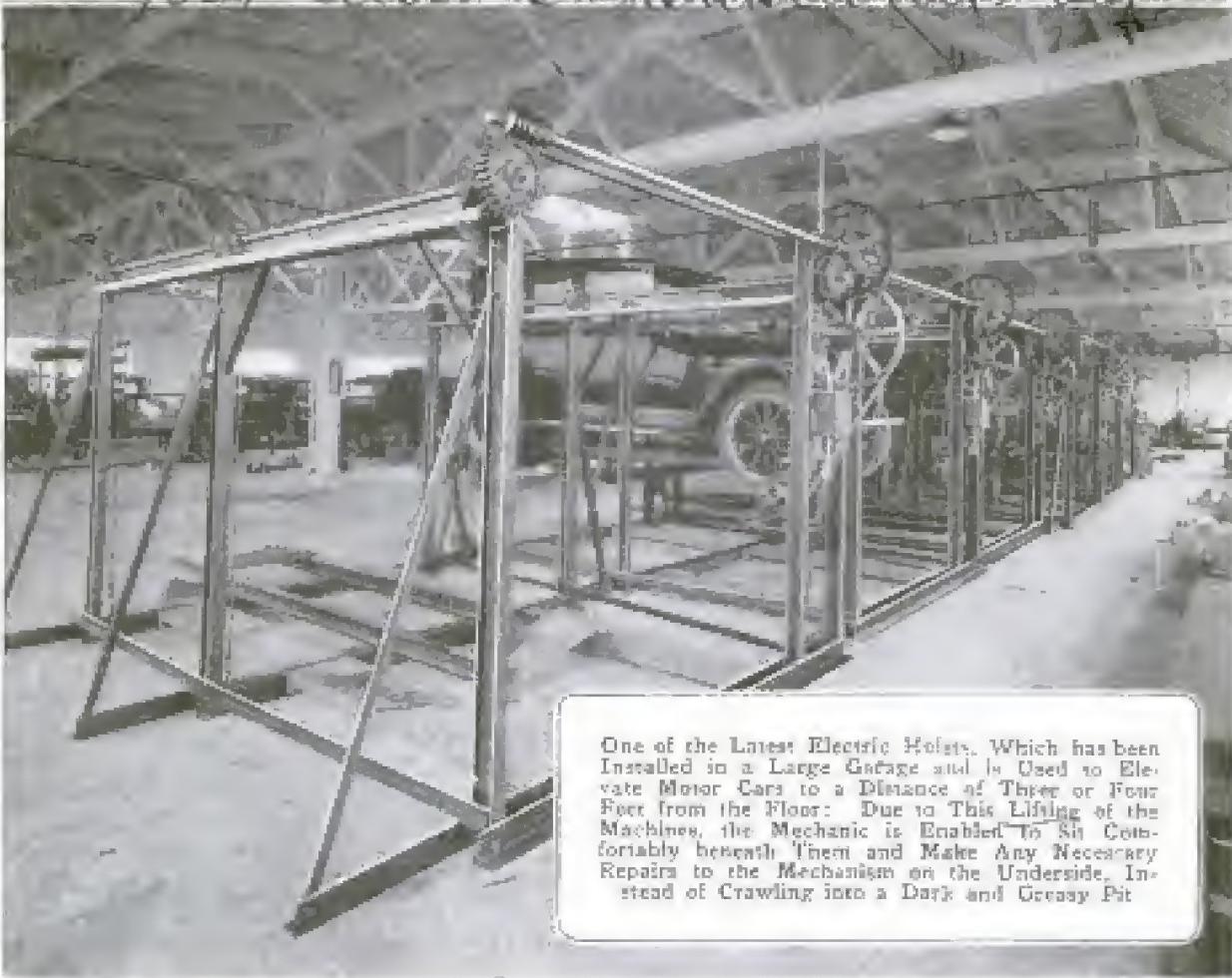


The Larger Size Portable Pumping Outfit, Showing Its Powerful Motor at One End That Drives the Centrifugal Pump at the Other End, with a Capacity of 900 Gallons per Minute. By the Side of It Is the Priming Pump

133 Auto Palace Sales Co.

POPULAR MECHANICS

1551 Alice St., Oakland, Calif.



One of the Latest Electric Hoists, Which has been Installed in a Large Garage and is Used to Elevate Motor Cars to a Distance of Three or Four Feet from the Floor: Due to This Lifting of the Machines, the Mechanic is Enabled to Sit Comfortably beneath Them and Make Any Necessary Repairs to the Mechanism on the Underside, Instead of Crawling into a Dark and Oily Pit.

133 MOTOR CARS HOISTED IN AIR FOR UNDERSIDE REPAIRS

Repair work on the underside of motor cars has been made easy by the introduction of an electric hoist which raises the machine 3 or 4 feet from the floor. The lifting appliance is a structural-steel framework of I-beams and angle irons. The car is run upon a base and then elevated by means of a cable drum driven by an electric motor, until the desired height is attained. The installation of this apparatus does away with the necessity of crawling into a dirty pit under the machine and speeds up the repair work, thus proving a time and money saver for the garage man as well as the car owner.

AMUSING SIGNS ON WINDOWS OF RIVAL REPAIR SHOPS

"We Weld & Repair Anything but the Break of Day," reads the sign displayed on the window of a repair shop in Phoenix, Ariz., by which the owner of the shop, evidently worried because of the success of a competitor in the same block, hoped to hold his share of business. Not

in the least dispirited, his rival, a short time later, decorated his window with this



SIGNS DISPLAYED BY RIVAL REPAIR MEN IN PHOENIX, ARIZONA: THE SHOPS ARE IN THE SAME BLOCK ANNOUNCEMENT: "WE WELD AND REPAIR ANYTHING BUT A BROKEN HEART."

Phoenix Sheet Metal Works, 320 W. Washington
Mt. M. Welding Co. 436 W. Washington
Phoenix, Ariz.

The Wonder Products Co 1900 5/9 Popular MECHANICS

GARDEN-HOSE ROLLER CLAMP REPLACES CLUMSY REEL

Garden hose can be quickly and easily rolled up into loops of any desired size by the use of a simple appliance pro-



Garden-Hose Roller Clamp, of Which an Enlarged View is Shown, can Also be Seen at the End of the Hose, Making the First Loop.

duced by a northwestern manufacturer. The contrivance is a spring clamp that fits over and firmly holds the first two loops of the hose, after which the remainder can be rapidly rolled in a neat coil without using a clumsy reel.

FLEXIBLE SHAFT COUPLINGS OF SIMPLE CONSTRUCTION

A flexible shaft coupling of exceptional simplicity, and of positive action, now being manufactured, consists of two rings, one with a tongue and the other with a groove that fit together. In its



Tongued-and-Grooved Flexible Shaft Coupling in Its Simplest Form: Larger Sizes Have Hubs That are Keyed to the Shaft Ends

simplest form, these rings are drilled transversely with holes that are in line with the tongue and groove, and pass

through the ends of the shafts that are to be coupled. In these holes hardened pins are inserted, and the power is transmitted through them from one shaft to the other. Thus any parallel misalignment is taken care of by the tongue sliding in the groove, and any angular misalignment by the articulation around the driving pins. In couplings for larger shafts, hubs are keyed to the shaft ends, and the hardened pins are driven transversely into them instead of through the shaft.

34

ARGENTINE CORNCRIBS BUILT AS SELF-FEEDERS FOR HOGS

Corncribs, made with a few poles and woven-wire fencing, are commonly used in the hog-producing parts of Argentina. Corn and alfalfa are the two feeds depended on for fattening the animals. The cribs are usually placed in the center of an alfalfa field. The fodder is allowed to get a good growth before the hogs are turned in. When they are admitted, the fence of the corncrib is turned up for a foot or two around the bottom, and the pigs very soon "make hogs of themselves." Only a very small amount of corn is wasted, the value of which is



One of the Corncribs Constructed of Woven-Wire Fencing and Placed in Alfalfa Fields as Self-Feeders for Hogs.

counterbalanced many times over by the economical method of feeding.

For relief of the increasingly heavy cross-river traffic, a new bridge is to be built in London, England. It will be known as St. Paul's bridge, because it will span the Thames from a point just opposite the cathedral. It is to have a roadway width of 80 feet.

Sold by C. N. Breese, Comt. Mrs. G. S. Bollock,

General Agent, Carabobo, 39², Flores, Buenos Aires, Argentine Republic

103 emb. H. Colia Campbell
 Refer to 7 30 Park Ave. Park Ave.
 Popular Mechanics 101
ROTARY CEMENT KILNS CLEANED WITH SHOTGUN

Everyone knows that in an active volcano a crust of lava forms around the circumference of the crater. In the making of cement, a similar crust, or "ring" as it is called, forms in the long cylindrical kilns. The heat is so intense that the ground stone and other raw materials fuse into a solid mass. This "burning" is the most expensive and most important of the nearly 100 processes required to convert the raw materials into modern Portland cement, and calls for about 200 pounds of coal for every 376-pound barrel of cement made.

As this ring gradually grows thicker, and sometimes as long as 8 feet, it must be occasionally removed. When it has formed far from the working end of the kiln, it has been found more economical to shoot it away with balls fired from a shotgun than by shutting down the kiln and jamming or wedging it out.

At first the shells were charged with duck shot, but these were not strong enough. More recently one-ounce lead balls, similar to those used in a "deer load," are employed. A long-barrel, 12-

gauge repeating shotgun is the most commonly used. Once a wedge is cut from

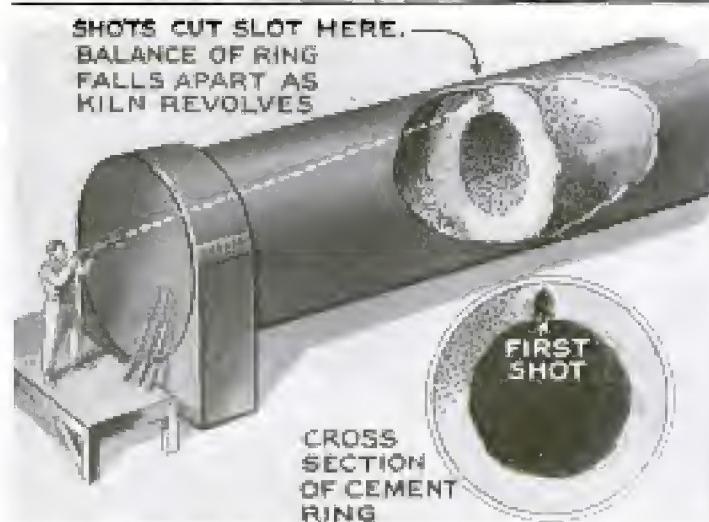


Using Shotguns to Clean the Crust, or "Ring," Out of a Cylindrical Cement Kiln, Showing the Workmen Standing outside the Kiln and Firing Heavy Deer Shot Until a Wedge is Cut through the Ring

the ring and the kiln is again made to rotate, the remainder of the ring breaks down.

When the shotgun method is not used, it is necessary to shut down the kiln, allow it to cool sufficiently to permit men to enter, and then jam or wedge it out by hand. This requires anywhere from one to two or three days, and entails an operating loss of about \$1,000. With the

shotgun process, the ring can be removed in from one to two hours, and requires about \$50 worth of shot, proving the economy of the method.



Phantom View of the Cement-Kiln Crust, Which can be Removed at a Far Less Expense with Shotguns than by the Old Method of Cutting It Out by Hand

208 **LARGE RADIO STATIONS IN CENTRAL AMERICA**

One of the most important radio developments to be reported in recent months is the placing of orders by a large fruit company and a tropical radio concern, for the erection of three 2,000-mile range wireless stations in Central America. Managua, capital of Nicaragua, will have one station, another will be constructed at Tegucigalpa, capital of Honduras, while the third will be located at Almirante, Panama.

7
738
9986MAY 1938
REGULAR MECHANICS**SWISS CHEESE IS EXAMINED
WITH X-RAY MACHINE**

Examining Swiss cheese with the aid of an X-ray machine is the method now in use at the Department of Agriculture,



X-Ray Machine for Examining Swiss Cheese, Showing How the Product is Placed in a Special Holder While Its Interior is Illuminated

and one which is said to be an entirely new departure in this line. The cheese is first placed in a special holder, or frame, after which the dairy specialist employed by the government can quickly determine, with his electrical apparatus, the presence of any defect in the interior of the product.

9986

**AUXILIARY AUTOMOBILE TANK
IS USED AS A FOOTREST**

An auxiliary tank for automobiles, which may be used for gasoline, water, or oil, or may have partitions dividing it into compartments for all three, has been patented by an English inventor. It is triangular in shape, and is placed in the



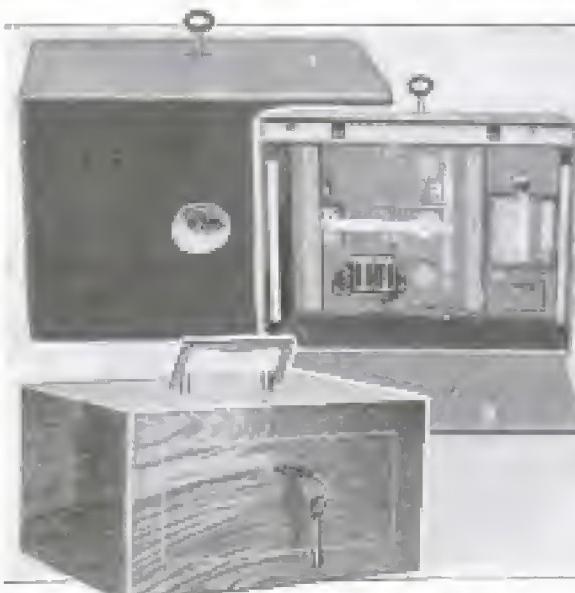
Auxiliary Gasoline, Oil, or Water Tank for Automobiles: Placed Under the Floor Rug Behind the Front Seat, It Forms a Footrest for the Rear-Seat Passengers

tonneau at the back of the front seat, and under the floor rug, where it forms a comfortable footrest for passengers in the rear seat, thus serving another useful purpose.

175

**STRONG BOXES SAFEGUARDED
BY LOUD-SOUNDING ALARM**

Protection against any tampering with a small safe or strong box is afforded by means of a loud-sounding alarm inside the box that starts the moment the box is moved even a fraction of an inch, and that cannot be stopped until the box is opened. Beneath a false bottom inside the box is an electric buzzer, to which is connected a small hammer that pounds rapidly on the side of the box. The buzzer is operated by a dry battery, the current from which is switched on by a contact device that is closed automatically by the slightest movement of the box. This is caused by the action of a small rod that protrudes from the bottom of the box holding up the contact



Strong Box Shown Closed, and Immediately Above, Opened with Its False Bottom Removed, Exposing the Electric Alarm: This Operates by Any Movement of the Small Rod Seen, at Left, Protruding from the Bottom of the Box

maker as long as its end is resting on any flat support such as a table or shelf. The slightest movement of this rod closes the electric circuit. The only way to break the circuit is by means of a switch inside the locked box.

Widening the Panama Canal at Gai-lard Cut, by shortening La Pita Point, is being done to reduce the possibility of slides, and to give a clear view to pilots of meeting ships.

The modern bakers,
H. Mackay, Ave., Chicago, Ill.



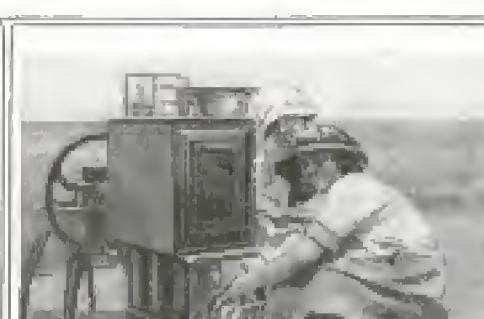
Above: New Grain Binder Which Cuts a 10-Foot Swath and Easily Harvests 35 Acres a Day. Below: Close-Up of Binder and the Tractor by Which It is Pulled and from Which It Derives the Power to Drive the Cutting and Binding Mechanisms. One Man Operates the Combination

155
**NEW GRAIN BINDER CUTS
35 ACRES A DAY**

A grain binder that enables one man to cut nearly twice as much as with any earlier type is a recent development in the implement field. This new binder, which cuts a 10-foot swath, differs from all others in that the power for driving the mechanism does not come from the main wheel, but from the tractor which pulls it. Independent of slippage of the binder wheels, this steady supply of power enables the binder to be run at a more uniform rate of speed and makes it possible to cut the wide swath, as well as permitting operations in soft ground and where the grain lies low. It reduces the hazards facing the farmer at harvest time.

**WHEAT CUT, THRESHED, GROUNDED,
AND COOKED AT ONE TIME**

By adding a small gristmill and an oil stove to the equipment usual in connection with the machinery required for harvesting and threshing wheat simultaneously, the crew was furnished with hot baked biscuits at the end of one trip around the large field, made from wheat harvested during the previous round. The wheat was ground in an old family gristmill, a relic of pioneer days, and the baking was done in an oil stove, set up on a near-by road and shielded from the wind by an umbrella. This unusual performance took place last July on John Rueschhoff's farm near Grinnell, Kan. Two women attended to the baking.



Left: Combined Harvester-Thresher at Work. Above: Baking Biscuits Made from the Wheat Just Harvested, and Ground in a Small Gristmill. Right: Harvester Crew Eating the Hot Biscuits



Cont. J. W. Collins, 8409 Penn
Kansas City, Mo.

11. Shipbreakers, Jan. 1914

IDLE SHIPYARD ADAPTED TO UNDO OWN WORK

BY D. R. LANE, 1624 *Capestrano St
Berkeley, Calif.*

RECENT experience in scrapping naval vessels on the Pacific coast brings to light the fact that shipyards—intended primarily for building vessels—can be adapted to the reverse operation to an extent well worth while from the viewpoint of owners who otherwise would see them standing idle for lack of orders.

At one yard where construction facilities thus were used for demolition, there was developed a plan for beaching the broken hulls on the sloping foot of

ess of demolition was exactly the opposite of that of construction. The vessels were laid up alongside what had been the shipyard's fitting-out wharf, wreckers stripped them of woodwork, and riggers and fitters removed as units the fixtures which could be sold entire. Then torchmen cut the ships down, course by course. When the hulk was so shallow that it could not be safely left floating, it was towed over the foot of the launching ways, tackle was rigged from deadmen up the ways over sheaves shackled to the hulk, and the cranes hauled up on the tackle. Advantage being taken of the tide, little difficulty was experienced in floating the hulls well up over the foot of the ways and then skidding them up the incline the rest of the distance. Beaching in this manner enabled the wreckers to get all the material from the hulk, instead of losing the last few hundred tons, as is usual with ships beached on mud-flats, and saved the cost of a drydock, which would have been out of all proportion to the profits of the enterprise.

In the wrecking work,

large engines were

broken up with explosives; small ones were cut out with the torch. Explosives were also used to start balky bolts, half a stick of dynamite doing the work cheaper and quicker than an hour's sledging. The propeller hubs were started off the tailshafts by the same method. As these were taper-fitted and pressed on by hydraulic rams, considerable difficulty had been anticipated, but a moderate charge of explosive loosened each one nicely.

Explosives came into play again in the close spaces of the lower part of the hull where the steelwork had been coated with cement. It was cheaper to crack the cement, or even to break a few inches of steel framing, with explosives than to chip out the steel with the torch.

The city gas was used for cutting torches, partly because of its cheapness, but mostly because tests showed that faster work could be done with it than with any other fuel available. A high-



Former Cruiser "Minneapolis," Showing the Protective Deck, Which Was Four Inches in Thickness and Composed of Three Plates, Blind-Riveted Together, after Cutting by Gas Torches

the launching ways, to avoid renting a drydock for the final stages of the work; ordinary city gas was substituted successfully for acetylene or hydrogen in oxygen-cutting torches, and explosives were used in a variety of ways believed new to ship breaking.

The vessels broken up at this yard were the "Marblehead" and "Minneapolis," of 2,089 and 7,375 tons, respectively. The cruiser "Brooklyn," 9,215 tons, was largely cut up at a junking yard near by, but the hulk was brought to the shipbuilding plant in question to be beached and broken up. While none of the three ships would be considered a large vessel, by modern naval standards, the methods employed in breaking them were chosen with an eye to efficiency and economy, and the work was arranged in such a manner that the experience gained might serve as a foundation for operations on the larger craft soon to be sold for scrapping. In general, the proce-



Above: Operator at Work Cutting Up One of the Eight-Inch Guns of the Old Cruiser "Brooklyn," with Torches Using City Gas Instead of Acetylene or Hydrogen. Guns of Scrapped Naval Vessels are Always Disassembled before Sale. Below: Cutting Up the Inner Shell of One of the "Brooklyn's" Gun Turrets. Several Pieces of Eight-Inch Armor Plate, Taken from This Turret, can be Seen under the Gun at the Left. The "Brooklyn" Was One of the Ships That Took Part in the Defeat of Admiral Cervera's Fleet off Santiago, Cuba, in the Spanish-American War, and has Long Been Obsolete Like the Other Ships of the Famous American Squadron, Many of Which have Served as Targets for the Guns of Newer Men-of-War.



Another View of the "Minneapolis," Showing the Deck After the First Course of Steel Plating had been Removed for Part of the Distance around the Ship. This Illustrates the Effectiveness of the Gas Torches in Reducing the Heavy Armor Plate of Battleships to Salable Junk.

pressure main was already in the yard, installed to feed its rivet-heating furnaces during the war, and this was simply coupled to the fuel side of the cutting-pipe system. The city-gas-oxygen flames cut up the entire protective deck of the "Minneapolis," built of three laminations of heat-treated steel, without a fragment being thrown, according to those in charge of the work.

Definite figures on the cost of demolishing these vessels have not been made public, but enough is known to warrant the statement that the steel and other ferrous materials removed nearly or quite repaid the investment and the cost of scrapping, leaving the proceeds of the brass and bronze scrap wholly or nearly clear profit, which result would likely be the same with larger ships.

149



Top: Showing How Inserts are Placed between the Leaves of the Spring and Pivoted on the Oiler. Bottom: Ordinary Leaf Springs Containing Steel Inserts and Oiler.

AUTOMOBILE SPRINGS OILED IN EFFECTIVE MANNER

Lubricating the springs of a motor car can be accomplished in a rapid and efficient manner by the installation of a special oiler and steel inserts. These inserts are placed between the leaves of the spring and have $\frac{1}{4}$ -inch slots cut through their centers, running lengthwise of each leaf to within 1 inch of the ends. When oil is forced, by means of a "pressure gun," down through the oiler, the lubricant passes out along the inserts, flowing in the slots until every portion of the leaf has been reached.

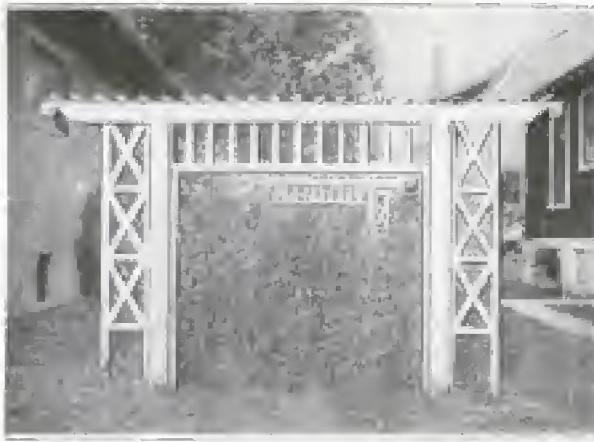
Center - Head Spring & Insert Sales Co.
Coal Exchange Plaza. Wilkes-Barre, Pa.
Copyright material.

**LIGHTWEIGHT CONCRETE HAS
SLAG IN PLACE OF GRAVEL**

245 Experiments conducted in France with concrete made with slag have proved that, other things being equal, slag concrete is rarely weaker, and generally a little stronger, than ordinary gravel concrete, and that its weight is from 30 to 40 per cent less. The ratio of strength to weight is at its maximum when the proportion of sand is from one-fourth to one-fifth that of the slag used as aggregate. In practical applications this reduction of dead weight is specially advantageous in such structures as arch and suspension bridges.

199
**SWEET-PEA TRELLISES SERVE
AS CLOTHESLINE POSTS**

Wanting a bit of garden to brighten his home and finding it necessary to stretch a clothesline in the only place available, a resident of Fargo, N. D., built the necessary posts so as to serve at the same time as sweet-pea trellises. This he



The Sweet-Pea Trellises Pictured Above were Built to Serve Also as Clothesline Posts

did by stretching wire netting between uprights of 6-by-6-inch timbers, using lighter lumber for the crosspieces and finishing the design with 2-inch lattice. This combination of the ornamental and useful makes a quite pleasing impression.

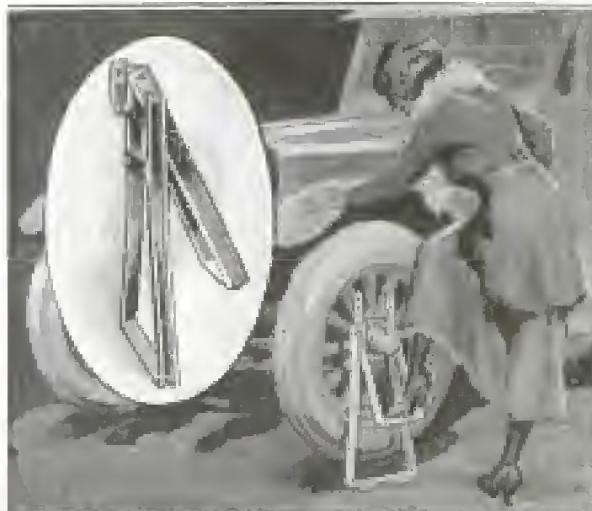
C.L. Miller 100-41148
SUPPORTING JACKS FOR AUTOS

748 ADD TO LIFE OF TIRES

It is well known that the life of auto tires is considerably lengthened if they are relieved from the weight of the car while standing on the damp and oily floor of the garage. This can be done readily by a simple lifting jack that is

*Beard Auto Lift Co.
Auburn, Ind.*

now on the market. It is made entirely of steel, and a set of four, one for each wheel, weighs only 25 pounds. In the



Steel Supporting Jack for Relieving Tires from the Weight of the Car; Inset Shows Enlarged View of the Jack, Which Is Adjustable for Any-Size Wheel

supporting frame is pivoted a lever, at one end of which is a sling that is placed under the wheel hub, which is then lifted by pressing on the other end of the lever with the hand or foot.

**COMPOSITION SHINGLE SERVES
AS TILE OR FLAT PATTERN**

A western manufacturer is introducing a shingle made from prepared roofing that can be used to represent a Spanish tile roof or laid flat according to a geometric design. The advantage lies with the dealer who can supply the demands for two kinds of roof from a single stock.



Roof Covered with New Composition Shingles, Which can be Laid Flat in a Geometric Pattern, or So as to Resemble Tile

*The Paraffine Co., Inc.
San Francisco, Calif.*

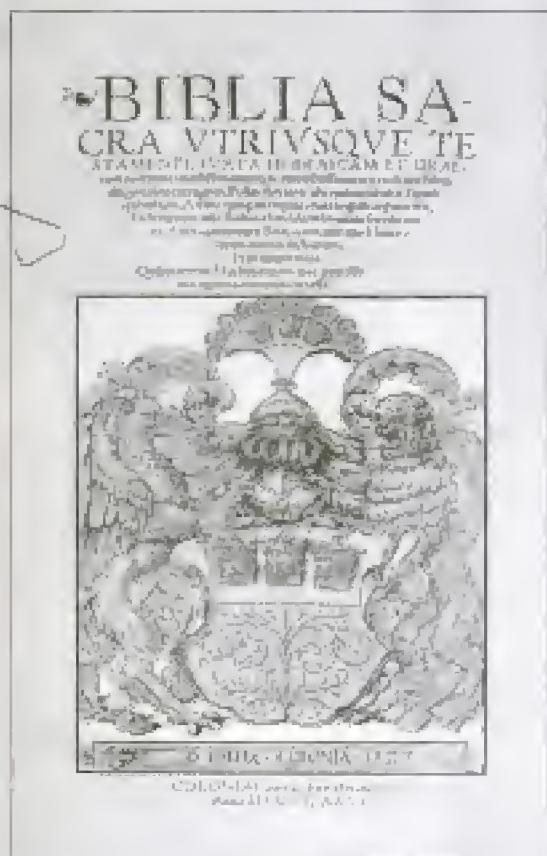
Carl F. H. Hollingsworth, 213 Trinity Bldg

744

POPULAR MECHANICS

169 Dartmouth St., Boston Mass.
RARE COPY OF BIBLE DONATED
9884 TO AMERICAN LIBRARY

The only known copy of the first Protestant Bible printed in Latin has recently come into the possession of the



Title Page of Bible Recently Presented to Cambridge, Massachusetts, Public Library: Note Coat of Arms of City of Cologne

Public Library at Cambridge, Mass., the gift of an anonymous benefactor. It is valued at \$100,000 by the library authorities, which seems reasonable in view of some book transactions. Henry E. Huntington, owner of one of the finest collections of rare books in the world outside the British Museum, once paid \$50,000 for a copy of the Gutenberg Bible, of which 20 copies are known to be in existence. Book collectors value books according to their rarity, condition, some special feature such as an autographed copy, first edition, or some peculiarity for which the book may be notable. This Latin Bible, which was compiled by one John Rudelius, a noted scholar and graduate of the University of Frankfort, Germany, is not only a first edition, but it is in as perfect condition as a book of its age could well be. It was dedicated "to the Most Wise and Learned Fathers of the City of Frankfort, and to the Consuls

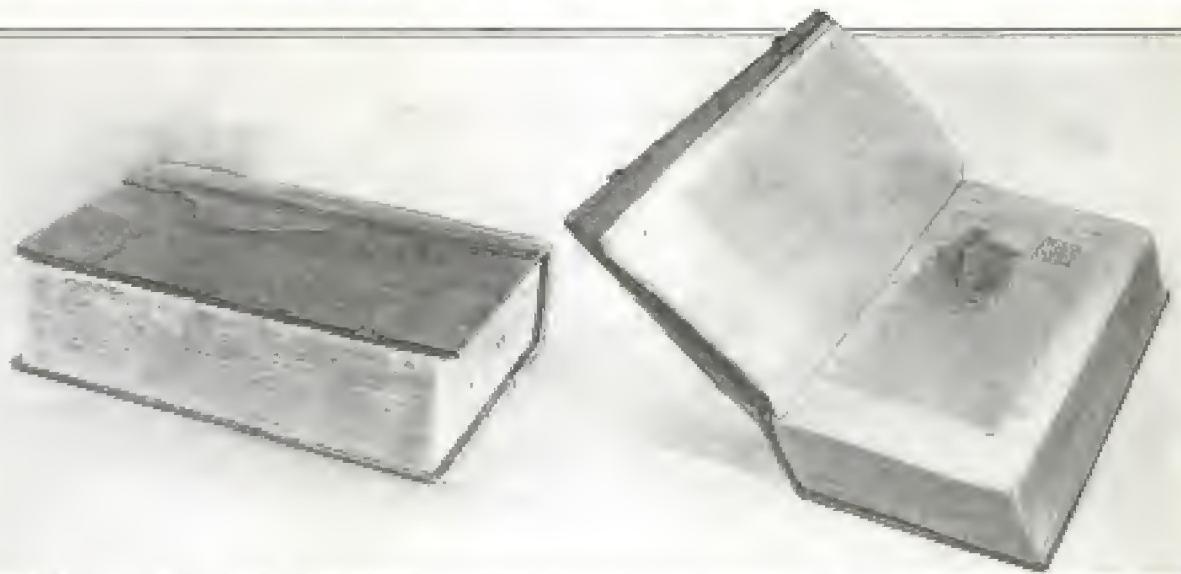
and Senators Most Highly Esteemed and Always Highly to be Honored by Me, Their Student and Disciple." Another feature is the title page and summary of contents, this being one of the first books to be so provided.

The printing of this edition was done in 1527, at Cologne, by Peter Quentel, who shortly before had printed an edition of the New Testament for Tyndale. The text is in black letter, with numerous woodcuts by Anthony of Worms, some of which had been used in the Grenville edition of Tyndale's English New Testament, published in 1526. These woodcuts are excellent examples of wood-block engraving; four of them, used as initial pieces at the head of each page in the four Gospels, being of especial interest. The four Evangelists are here represented as follows: Mark with a lion; Luke with a bull; John with an eagle; and Matthew with an angel dipping his stylus in the inspiring sun-light. The volume is a sample of skillful printing and painstaking work in the letterpress, for it is as bold, black, and clear as work done by the printers of today. The binding is still strong, and the vel-



Page from Latin Bible, with Cut Representing the Evangelist St. John with the Apocalyptic Figure of an Eagle

9884



This Bible, Valued at \$100,000, Is the Only Copy of Its Edition Known to Exist. It is Shown Opened at the First Chapter of Genesis, the Figure Representing the Creation of the World

bum cover, though stained and yellow with age, is perfectly sound. The dog-eared condition of the margins, title page, and front pages, shows that it has been much handled and read, giving to it the appearance of the deckle edge, affected in many present-day books.

9829 MAPPING VEGETATION WITH A PANTOGRAPH

The millions of acres of cattle and sheep ranges within our national forests, are under the management of the U. S. Forest Service, and one of its duties is to calculate the "carrying capacity" of each range; that is, the number of cattle that can be grazed on it without exhausting the range. For this purpose, intensive field studies are constantly being made in the western forests, many of which have already been completely covered by a thorough range survey.

One of the means by which the live-stock capacity of the range is found is the establishment of sample lots at regular intervals and in all different grass and weed-forage types. With the aid of a special pantograph, a detailed map is made of the area covered by the different kinds of vegetation on the plot. Two men operate the instrument. One manipulates the free-moving arm and with its pointer circles the base of each individual bunch of grass or weed stems. The areas thus circumscribed are reproduced on a small

The size of the original edition is unknown, but editions were never large in those days, amounting at most to only a few hundred copies. Another edition of this Latin Bible, printed in 1528, has disappeared from view, and it is safe to assume there is no other copy in existence.

scale by a pencil on a map board, and the resulting sketch shows a series of irregular patches, which represent the area covered by the forage plants, as compared with the total ground area of the plot. Large numbers of these plots are thus mapped each year, and the total percentage of increase or decrease in vegeta-



Photo by U. S. Forest Service
Pantograph and Quadrant in Use for Charting Vegetation on a Representative Plot, from Which the Forest Service Determines the Grazing Capacity of the Range

tion, due to grazing, is calculated. These data and the known forage values of the grasses are then used to determine how many cattle or sheep can be run on the area without injury to the range.

Cmt. W. d. Hutchinson, 430 F St., N.W.
Washington, D.C.

Copyright material

746 Series 9/7/2 -

PS

TIDE GAUGE ON RIVER BRIDGE HELPFUL TO NAVIGATORS

Recently installed upon the pier of a bridge across the Potomac River is a tide gauge which is operated by the rise and



Interim
Tide Gauge on a Bridge across the Potomac River Shows at Any Time the Number of Feet of Clearance between the River and the Bridge

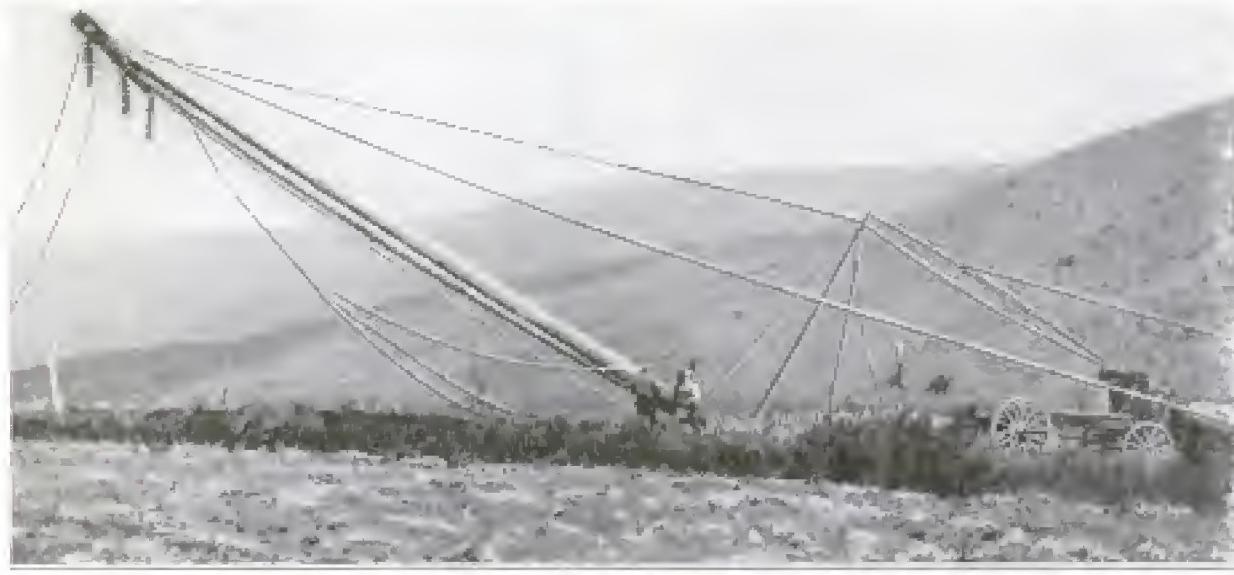
fall of the tide. On its dial a pointer, like the hand of a clock, indicates at any time the number of feet of clearance between the river surface and the bridge. This is of great assistance to tugboat captains, who can see at a glance whether it is possible for their boats to pass safely under the bridge or not.

PLANS BEING MADE TO BUILD 255 TWO 70,000-TON SHIPS

If Congress passes the ship-subsidy bill, it is stated authoritatively that an American company proposes to build two electrically driven ships, each of 70,000 tons gross, for service in the Atlantic passenger trade. These ships would, therefore, surpass the largest ship afloat, the White Star liner "Majestic," by more than 13,000 gross tons. As they are planned to be 1,000 feet long, they would also be 44 feet longer than the "Majestic." They would have accommodations for more than 3,000 passengers, and it is understood that they are to be propelled by electric motors supplied with current by generators driven by turbines or Diesel engines. The company will be wholly American, and the work will be done in yards in this country. The company, it is said, would also buy some of the U. S. Shipping Board's largest ships.

9648 POLES RAISED FROM GROUND COMPLETELY ASSEMBLED

Poles and towers for carrying the wires of the company that supplies electric light and power in Salt Lake City have the crossarms and insulators attached to them before they are raised from the ground. It is, of course, much easier to do this assembly work on the ground, and there is also the saving of the time expended in hoisting the materials to a workman after the pole is erected. It is just as easy to hoist the poles with the crossarms on as with them off.



Raising a Tower for Supporting Electric Wires, the Insulators Being Already in Place, and Thus Avoiding the Necessity of Hoisting and Installing Anything but the Wires Themselves After the Tower has been Erected

Utah Power + Light Co., Salt Lake City, Utah.



Corporal André Peugeot, the First French Victim of the World War; At the Spot Where He was Killed by German Uhlans, 30 Hours before the Official Declaration of War, the Monument Seen to the Right was Erected to His Memory and Recently Dedicated



MONUMENT TO FIRST FRENCH VICTIM OF THE LATE WAR

Corporal André Peugeot has been immortalized by having been the first French victim of the World War. He was killed by a band of Uhlans at Jonchery, near the fortified town of Belfort, just across the French frontier, on Aug. 2, 1914, 30 hours before the official declaration of war by Germany. At the spot where he met his fate, there was recently dedicated to his memory, with elaborate ceremony, a monument of stately proportions and impressive design.

AUTOMOBILE GRADIENT METER MOUNTED ON THE DASH

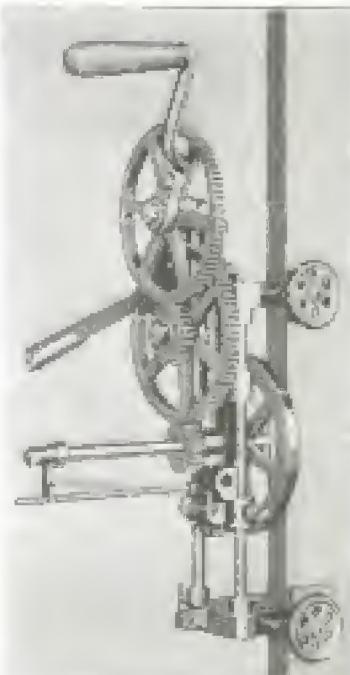
Another new instrument for the automobile dash is a gradient meter, manufactured in England, that indicates on a dial the percentage of any incline up or down which the car may be traveling. The graduations for rise or fall are divided from 1 in 4 to 1 in 30, showing grades, therefore, from about 3 to 25 per cent. The pointer is operated by the action of a pendulumlike weight, which



is immersed in oil in order to prevent it from being oscillated when the car is traveling over rough roads.

POR TABLE LOCK MORTISER USED ON DOOR JAMBS

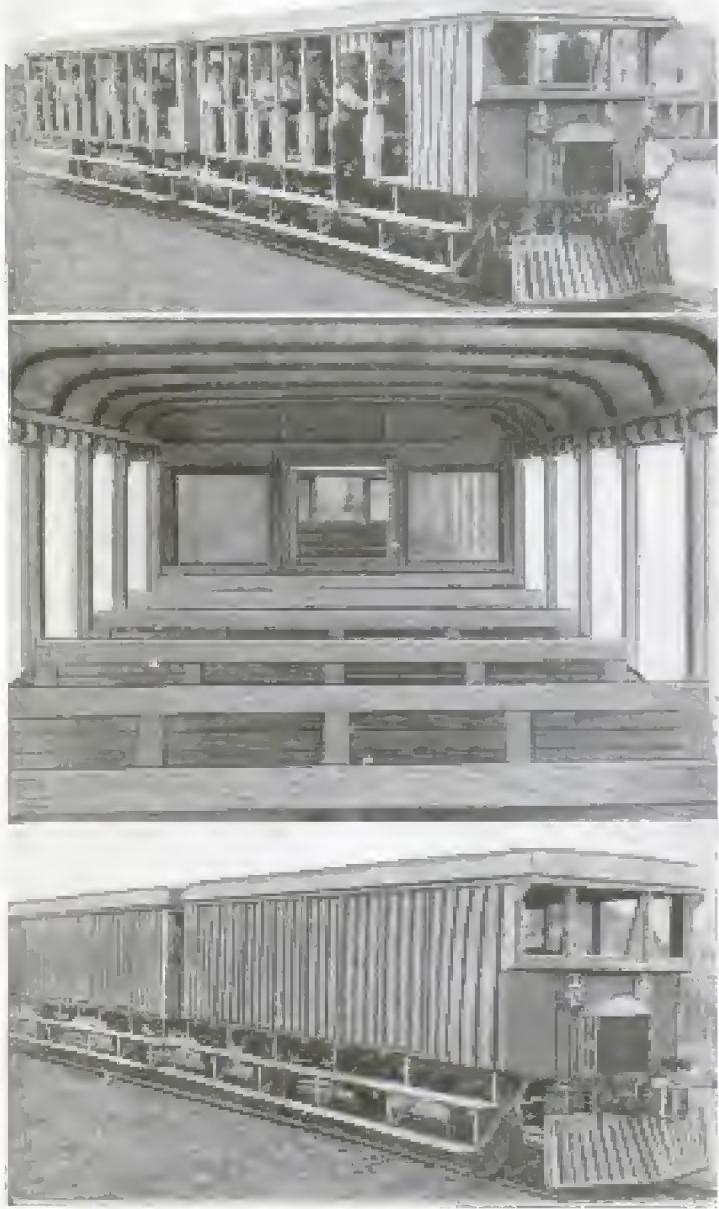
To make unnecessary the common practice of cutting mortises for locks in door jambs by hand, a portable lock mortiser has been constructed that will do the work better and in far less time. It will cut any mortise of from $\frac{5}{8}$ to $1\frac{1}{8}$ inch in width, up to $4\frac{3}{4}$ inches in depth, and 6 inches in length. The machine is readily attachable to the door jamb by means of self-centering clamps, and the only adjustment necessary—that of regulating the length of the mortise—is done by simply sliding a small sleeve up or down a vertical rod.



*Belmore Works
Totton, Southampton,
England.*

GASOLINE RAILROAD TRAINS
CUT OPERATING COSTS

Cutting the operating costs of short-line railroads or electric lines, and at the same time maintaining reliable transportation service, is possible with the use of equipment produced by a Wisconsin company. The innovation consists of a two-car unit of the open type, having ad-



Top: Gasoline-Operated Railroad Train of Two Cars, Showing the Open Construction and Running Boards on the Sides. Center: Interior of the Train, Showing the Seating Arrangement and Adjustable Curtains Rolled Up. Bottom: Adjustable Curtains Pulled Down as a Protection against Bad Weather.

justable curtains along the sides for protection against the weather. The forward car, which contains the gasoline engine, seats 35 persons, while that at the rear can accommodate 50 passengers. The outfit is equipped with air brakes, electric

starter and horn, standard couplers, locomotive cowcatcher, rail-sanding apparatus, and a high-speed reverse gear, all of which make it a highly efficient train.

UTILIZE WASTE TO INCREASE
SUGAR YIELD OF BEETS

In line with the movement for greater efficiency and the reduction of waste, a

Utah beet-sugar concern has followed four years of experimentation with the installation of equipment for recovering sugar from the molasses heretofore discarded by the plant. The molasses is chemically treated and filtered, after which it is subjected to an evaporation process, followed by boiling to the point of crystallization. In the later stages, the process and equipment are identical with those of a standard sugar-beet factory, and it is therefore possible to produce the additional sugar at a relatively small investment and with low operating costs. With a somewhat makeshift layout, 35 per cent of the waste molasses is recovered as sugar of good grade, and it is believed that as high as 50 per cent can be converted with a better plant. Aside from small quantities mixed with ensilage and some used as fertilizer, the molasses has been dumped into a near-by stream or spread over the ground to dry, so the new process will result in the saving of thousands of dollars to the sugar-beet industry. An added benefit is that the working season of the plants will practically be doubled, and the help employed longer.

WATERMELONS GROWN
UNDER HAY, STRAW,
OR CANVAS

Growing watermelons under cover of loosely applied hay, straw, and sometimes canvas, has produced in the Northwest irrigated regions, this summer, a superior fruit that is equal, it is claimed, to that of Texas fields. It is now believed that such covering, however slight, helps to keep in the ground warmth accumulated during the day, which, ordinarily, would be dissipated by the night air.

Mr. F. W. Flicker,
5021 - 12th St.,
Seattle, Wash.

Frank W. Flicker
5021 - 12th St.
Seattle, Wash.

Mr. Peter J. Rock
4511 Clifton Ave
Cincinnati, Ohio

BOAT CLEARS RIVER CHANNEL

TELEPHONE-DIRECTORY HANGER

q951 AND ALSO BUILDS LEVEES

8709 SIMPLE AND CONVENIENT

For clearing the channel of snags and obstructions and for building levees on either bank, a novel kind of dredge is used by U. S. engineers on the Ohio River, below Cincinnati. The boat—called the "Scioto"—is a modification of an ordinary dredge, the boom of the crane being used for hoisting snags from the river bed, and swinging them onto the banks, where they are suitably disposed of. At the stern is a long derrick that carries a pipe from the vessel to a rotating cutter at the end of the derrick. When in operation, the boat is anchored at any point where the channel has to be cleared, the cutter is lowered to the river bottom, and is driven by power from the vessel. This has the effect of cutting up the material sufficiently to allow it to be sucked through the pipe into a receptacle in the interior of the vessel. From this pipes extend laterally to the shore, which may be as long as 300 feet, and these pipes deliver the material suitably for disposing of it, if desired, in the form of a dike or levee. When this operation is completed at one point, the vessel is moved a distance of 4 feet, anchored, and the operation repeated. Thus the process continues for any required distance.



Dredge That Clears a River Channel and Builds Dikes or Levees on Shore: At Left and Above Are Two Views of the Derrick That Projects from the Stern of the Boat, and Has a Rotary Cutter at the End of It. At Right are Shown the Pipes That Connect the Vessel with the Shore

Having the telephone book near the instrument is a great convenience, and a simple holder has been constructed which can be easily and quickly attached. The book is opened at the middle, the light polished-metal holder inserted, and the whole hung on a hook or nail by the ring at its end.

Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine.



The Colgate Laboratories, 565 W. Washington St., Chicago, Illinois

COMBINE SUBWAY, SURFACE, AND "L"-SYSTEMS

BY GEORGE F. PAUL, 900 Ellsworth Rd., Chicago.

THE city of Cincinnati is busy at the present time in trying to free itself

from traffic congestion in the main parts of its business district. To handle the thousands of passengers that pour into this district every workday morning, and then late in the afternoon make a frantic scramble to reach their homes in the distant suburbs, a rapid-transit railway is being built.

It will be a combination subway, surface line, and elevated system, the plan being varied to suit the different conditions encountered. The system, when completed, will be a belt line, with all the latter's decided advantages. In 1916, the city voted \$6,000,000 for this plan, when this sum was thought sufficient to build the entire system,



Above: Vertical Reinforcing Bars That Form Part of the Side Walls of the New Cincinnati Subway Tunnels.
Below: Excavation for Subway, Showing Bottom Concrete in Place, and Side Wall, as Well as Some of the Arched Forms



View of One of Cincinnati's Subway Tunnels, Showing the Completed Concrete Work before Backfilling: Note the Small Track on the Roof of the Tunnel, Which Carried the Concrete Cars from the Mixer to the Forms

but with soaring labor and material costs, much more will be required to complete it. However, the work has been pushed in spite of many obstacles, and at present about two miles of subway has been completed, $4\frac{1}{2}$ miles of open work is constructed, and the line will probably be operated at first from Oakley to Race and Canal streets.

In one respect at least those urging this combination line have been fortunate: They have been able to obtain from the State of Ohio the right of way for a considerable distance along the old bed of the Miami and Erie Canal. This has meant a great saving in excavation costs and has speeded up the work materially.

Whenever a Cincinnati business man who lives in the suburbs to the north of the river wants to reach the heart of the city, which is in the vicinity of Fountain Square, it is necessary for him to cross practi-

cally the whole city. To the east of Mill Creek, on a slight elevation, stands this business district. At a varying distance from the river rise the bluffs that are so common throughout the Ohio and Mississippi valleys. A rolling country stretches



Subway Tunnel under Construction, Showing How, in Many Places, the Concrete was Run through a Chute into the Forms, Direct from a Movable Mixer

away from the brow of the bluffs. The number of streets tapping the business district from these bluffs is strictly limited, and with street-car lines on practically all of them and the number of automobiles steadily increasing, traffic is so slowed down that the worker in the business district spends entirely too much of his time in getting to and from his work.

The belt line is intended to help handle the cars of the interurban lines. It is planned to run the interurban cars to the heart of the city over the new tracks until such a time as the other traffic makes this impossible. A combination interurban and loop station on Canal Street will prove one of the main points on the new system.

There are to be no grade crossings on this new line. This means that far greater

speed will be possible and far greater safety will be assured. The line will be double-track, standard-gauge, with power from a third rail. With 4-car trains spaced 1 minute 9 seconds apart, it is estimated that more than 100,000 passengers can be handled an hour. Each car is to be 70 feet long. Reinforced-concrete construction has been used in building the double-tube structure for the subway portion. In order to admit freight cars, if necessary, the tubes have been built with a clearance of 14 feet 9 inches over the top of the rail. Reinforced concrete has also been chosen for building the elevated portion of the line. Block systems, ventilating openings, emergency exits, and other late safety appliances and measures, have been adopted to make it an up-to-date system.

NAIL-Straightening DEVICE EASY TO OPERATE

194.

For straightening badly bent nails or spikes rapidly and easily, a small, simple machine is in use in Germany. A verti-



Nail-Straightening Device Shown Above with a Bent Nail in Place Ready to be Straightened by Swinging Back the Vertical Lever, as Shown Below

cal hand lever is pivoted to one end of a stand which has at the other end a slotted device, into which the bent nail can be dropped when a second small hand

lever connected with it is raised. Hinged to the vertical hand lever is a rod that passes through this slotted portion of the stand, and has connected to it a lug that holds the head of the nail. In operation, the vertical hand lever is pressed forward, the nail is dropped in, and the second small lever is pressed down upon the nail. Then the vertical lever is swung back, drawing out the nail straightened.

TEXTILE INDUSTRY TRYING TO SPIN KAPOK FIBER

24. Kapok fiber, that buoyant material now used so extensively in the manufacture of mattresses, pillows, cushions, and life preservers, is being made the subject of exhaustive experiments by the textile industry. The object is to find a means whereby this peculiar substance can be spun into thread. So delicate is this fiber, which is short and brittle, that it is broken into tiny particles as light as dust, at the slightest tension. Nevertheless, the possibility of spinning this valuable product, which comes from South America and Java, is the goal toward which many manufacturers and laboratory workers the world over are expending ceaseless effort.

N.M. Series 9/5/28 8.29

Posts, poles, and ties cut from blight-infected chestnut trees are as durable in service as similar timbers cut from healthy trees, according to the U. S. Forest Service, although it is advised that these timbers be cut as soon as possible from the trees infected with fungous decay.

**ADOBÉ BUILDINGS
LONG IN RUINS
REMODELED**

IT HAS become a popular practice with artistically inclined Californians to purchase the old ruined adobe buildings at Carmel and Monterey, and convert them into modern studios and residences. The remodeling is done so as to make them architecturally as attractive as possible, and in connection with some of them are historic associations that make them additionally interesting.

Specimens of such buildings are shown in the accompanying illustrations. At the top is a view of an adobe building at Carmel that had been in ruins for about 100 years, and was remodeled into a charming and strictly modern tea room.

Below this is an old adobe house at Monterey that was purchased by an artist, who converted it into a studio, framing into it the large window at the gable end, that gave him all the light necessary for his work.

Next below is a view of an old adobe building, at Monterey, in its unimproved condition, giving an idea of the work that has to be done in remodeling it, reflooring it, and installing it with plumbing.

Below this, taken from another point of view, is the same building after it was remodeled, showing the wonderful results possible with such unpromising material. The walls are about three feet thick, and the work that had to be done on them was far from easy.



RIVER MADE TO PURSUE PRESCRIBED COURSE.

By J. B. HOLDCROFT

1915 Fort Victoria B.C. Canada

THE Capilano River near Vancouver, B. C., formerly had the habit of wan-

effective nature would have to be adopted.

Previous attempts to put in abutments

the current of the river could not move, had proved futile in the case of a highway bridge higher up. So, just above the bridge on the threatened bank, a simple little structure of logs and wire was extended 18 feet into the stream. This caused an eddy and checked the current enough so that entrained sand, stone, and floating débris were dropped out, and the formation of a bar begun on the river bottom. Then other



Wreck of Highway Bridge, above the Railway Bridge, Caused by the River during One of its Flood Periods

dering over flats about a mile wide, for some distance near its mouth, flowing in one place one year and in another the next. The construction of a railroad bridge at this point made it necessary to reduce the width of the river bed from 900 feet and confine it to a channel barely 200 feet wide.

Soon the river began wearing away the west bank, however, seeking a course it had undoubtedly followed before, which action was particularly destructive



View of River during the Dry Season, Showing the Railway Bridge in the Background and One of the Jetties with the Sand Bar Which It Causes to Form in the River Bed



Railway Bridge with Two 100-Foot Openings Bottling Up the River Which Was Formerly Nearly a Mile Wide at Its Mouth

in periods of high water, and it became apparent that protective measures of an

ught had to be taken. Before it was stopped, the current



General View of Highway Bridge, Showing How the River Turned from One Side to the Other in Sweeping Out Both Approaches with Its Swift Current: Note Temporary Truss over the Most Easterly Span, and the Temporary Structure at Each Approach

had washed the rock filling from the wooden abutment pier, and later the central pier. This was stopped and the piers repaired by letting down into the water in front of them, woven-wire fencing covered with branches. Finally, to protect the east bank, a mattress of wire fencing

and branches interwoven, was laid over it from the bridge for 900 feet upstream. Since this work was completed, no trouble has been experienced at the railroad bridge, but considerable damage has been done farther upstream, owing to the river changing its course several times.

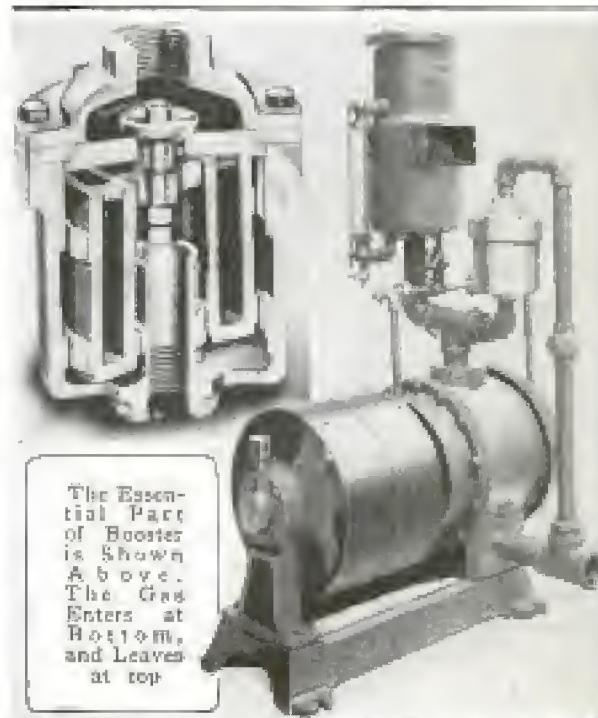
37

ADVANTAGES OF NEW BOOSTER IN GAS-BURNING PLANTS

In plants using gas for heat treating, forging, and other work, the gas pressure, as delivered by the gas mains, will vary from time to time as the demand for gas is made, either in the plant itself or by outside influences, changing, thereby, the ratio of air and gas and causing a corresponding change in the combustion conditions. This causes waste of a great amount of gas. To overcome this waste, and in other ways improve the efficiency of the installation, a gas booster has been developed which assures a uniform volume and a nonpulsating gas pressure, and thus permits the proper adjustment of burners.

An excess of air supplied to the burners produces an oxidizing flame, which, in addition to wasting gas, causes scaling in heat treating and forging work, while insufficient air wastes gas by incomplete combustion. Neither of these conditions gives the maximum amount of heat for the amount of gas used. Experienced engineers have found that the best method of burning artificial gas is to increase or boost the pressure to about 7 pounds per square inch, and entrain the necessary air from the surrounding atmosphere at the point of application through an injector. This method, applied in the device here in question, relieves the op-

erator of all adjustments of air and gas, and results in uniform heating and a constant combustion condition. It also eliminates air piping throughout the plant,



and moreover, as the gas is under pressure, a much greater volume can pass through existing lines than could be had with the low pressure supplied by the main.

Peach-Ohio Co., Hudson Terminal Bldg, New York City. Copyrighted material

SUBSTITUTE FOR SCARECROWS DEvised BY SUMATRANS

165 Farmers on the North American Continent who spend considerable money gunning for crop-destroying birds, when scarecrows have failed to perform their



Substitute for Scarecrows in Sumatra: The Native on the Platform Strikes the Bamboo Poles, Setting in Motion the Bells and Rattles That Scare Away Birds

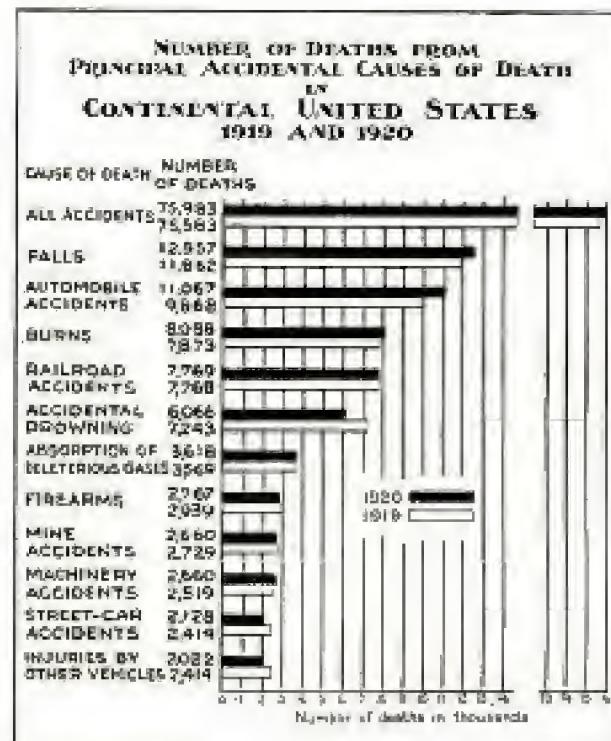
office, can get a valuable tip from the native farmers of Sumatra.

At the edge of the field to be protected, the farmer erects a strong high pole. At the top of this is built a small, well-braced platform, with a railing. To the railing are fastened two or more bamboo rods. From the rods strong cords are carried in all directions to upright flexible stakes, which are set around the boundaries of the field in such a way that an almost netlike stretch of lines covers the growing crop. To the cords, at short intervals, are attached grotesque paper representations of the spirit of the forest, previously placated with many offerings of fowls and pigs. In addition, though not intended in any way to imply doubt of the efficacy of the spirit, are hung little bells made of wood, which give off clicking sounds. At other places on the string are placed wooden rattles.

Just as the day is dawning, a member of the farmer's family, generally a small boy or girl, goes to the contrivance, climbs to the platform, and stays there till the last bird has disappeared at evening. During the daylight hours, the watcher is constantly on the alert, and whenever birds come near the field, the boy or girl strikes the bamboo poles, thus setting in motion the paper images, the wooden bells, and rattles, which latter are peculiarly discordant. The method never fails to protect the fields.

140 TOLL OF ACCIDENTAL DEATHS REACHES HIGH MARK

Seventy-six thousand persons died during 1920 from accidents which could have been avoided, according to statistics presented at the Eleventh Annual Safety Congress by the National Safety Council. Falling accidents of various kinds accounted for the largest percentage of deaths. Other causes in order of importance were: railroad accidents, drownings, deaths from gassing, firearms, mine accidents, machinery, street cars, other vehicles, and conflagrations. Twice as many men as women were killed, although the latter suffered greatly from domestic hazards. Children under 15 years of age figured in one-third of all automobile fatalities.



This Chart Presents a Comparison of the Number Killed in Accidents from Various Causes: The Black Lines Indicate the Toll of 1920, While 1919 is Represented by the White

9935

*International*

AMATEUR BEDOUINS ON THE WARPATH

WHAT appears to be a Bedouin sheik leading his band of desert rovers across the sands of an African waste, is only the members of a moving-picture producing company out on "location." The scene is from a spot less than 75 miles from Los Angeles, California, where the Mojave Desert, with an approximate area of 25,000 square miles, affords the necessary environment and atmosphere for the filming of photoplays, the scenes of which are laid in Egypt, Arabia, or other lands of northern Africa.

9632

CONCRETE PIERS REPLACED BY UNUSUAL METHOD

An unusual method was employed in the replacement of concrete piers under a viaduct on the Columbia River highway near Portland, Ore., which had been damaged the preceding winter by heavy drifts of snow. The customary wooden forms were built



beneath the viaduct floor, holes cut in this, and the concrete poured down into the forms from the roadway above. In addition to replacing the old supports, new piers to the same number were added, to prevent a possible recurrence of the trouble.



Top: Concrete Mixer, on the Viaduct, from Which Workmen are Taking the Mixture in Wheelbarrows to the Forms. Lower Left: Underside View, Showing the New Piers. Lower Right: Workmen Building Wooden Forms in Which the Concrete for the Additional Piers was Poured

*Cord H. E. Thomas, 911 Dunckley Av
Portland, Oregon*

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215 CONCRETE WALLS DESTROYED PNEUMATICALLY

Pneumatic hammers, used by street railway, telephone, telegraph, and other

companies as paving breakers, were recently employed in demolishing the reinforced-concrete walls of a vault in a factory in Cleveland, Ohio. The work was expedited by having two men handle each breaker, and in this manner a 24-inch wall, 20 by 23 feet in area, was completely demolished, reinforcing rods and all, in three days. The concrete was broken up into pieces small enough for one man to handle easily, and for the reinforcing rods a cutting tool was used in the pneumatic hammers. The side walls of the vault were 12 inches thick, 10 feet high, and 51 feet long. Only 7 days were required to remove them completely, and the work was done more cheaply than by hand methods.



Part of a Reinforced-Concrete Wall being Destroyed by Pneumatic Hammers, Each Operated by Two Men to Make the Work Speedy: The Reinforcing Rods Still Standing were Broken Up Later with Cutting Tools

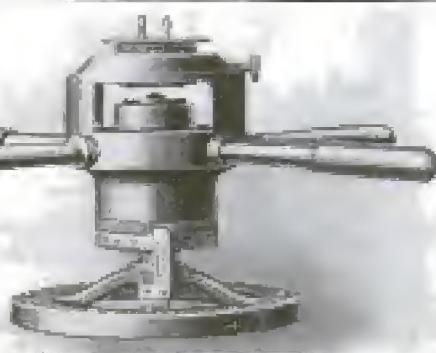
36

IMPROVED TESTER TELLS WORKABILITY OF METAL

A machine has just been developed that will determine by actual test the

workability of metal by means of a penetration ball and micrometer screw, a micrometer thickness indicator which shows the thickness of the sheet or wire under test. A tester of this kind will save many dollars by eliminating improper material before much money has been spent in fabrication.

Utilization of the Humber River, Newfoundland, in the production of electric power can be done so economically that it is estimated 186,500 kilowatts can be obtained as the result of an expenditure of only about \$97 per kilowatt.



This Machine Determines by Test the Drawing, Stamping, Folding, and Compressive Qualities of Sheet Metal and Wire

drawing, stamping, folding, and compressive qualities of sheet metal. The machine is of rugged design and intended for use in the shop as well as the laboratory. By means of a special die and holder it is possible to test wire or rods of any material, up to No. 4 wire gauge. The machine combines with the regular inden-



Specimens of Metal Tested by New Machine Which Indicates by Depth and Roughness of Dome, and Character of Fracture, the Workability of the Metal



Above: First of the 80 Houses being Moved from Jennings to Cadillac. Right: Backing the Trailer under the Jacked-Up House

40



HEAVY MOTOR-TRUCK TRAILER MOVES 80 HOUSES 11 MILES

Some 80 frame houses that formed the little village of Jennings, in Michigan, are being moved to Cadillac, 11 miles away. A large trailer for use with a powerful 6-ton motor truck has been specially built for the purpose. The trailer, constructed with a heavy steel frame, has a capacity of 40 tons. The plaster was removed from the first house to lighten the load, but the truck and trailer handled it so easily that this was not considered necessary with the other houses. The transportation is taking place at the rate of several houses a week.

87

PHILADELPHIA'S PUBLIC BEACH IS LARGEST IN COUNTRY

Just completed and thrown open to the public, Philadelphia's municipal bathing beach is reported to be the largest in this country. The two bathhouses, located on an artificial lake in League Island Park, have a combined capacity of 6,000. Provision for 3,500 is made in the men's bathhouse, while 2,500 can be taken care of in the women's quarters.

Both houses are equipped with steel lockers, special care being taken in the women's building to group the lockers so as to assure privacy. The dimensions of each building are 51 by 222 feet.

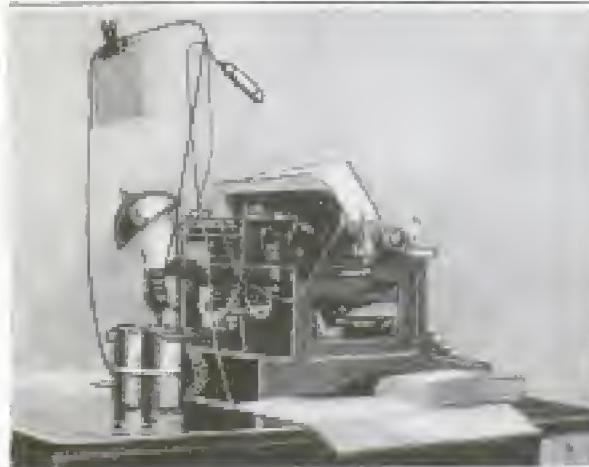


The Two Bathhouses, Pictured Above, were Recently Opened by the City of Philadelphia. They can Accommodate 6,000 Persons. Below is Shown the Interior of the Men's Quarters before the Installation of Lockers

Cmt. John H. McClarren,
1026 Walnut St. Philadelphia, Pa.

ELECTRIC LIGHT ON MACHINE AIDS DEAF TYPIST

Handicapped by deafness, a typist overcomes this affliction to a great extent, when writing on his machine, by having



Typewriter of a Deaf Man Which Includes a Small Electric Lamp So Wired That It Lights When the End of a Line Is Reached

installed on it an electric light in addition to the usual tabulator bell. Current is obtained from flashlight batteries, which are so wired that when the typewriter carriage reaches the tabulator stop, contact is made, and a red lamp suspended in front of the writer is illuminated.

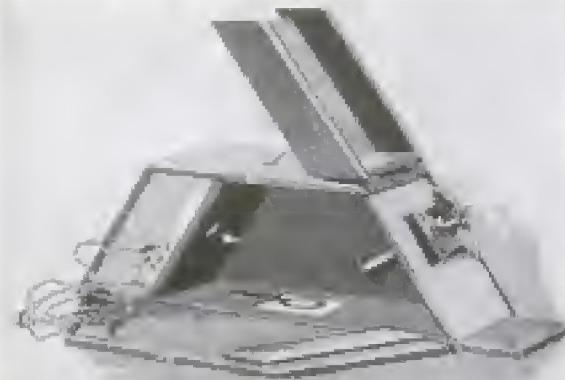
PROVING-GROUND FIRE CAR HAS COMPLETE OUTFIT

Protection against the fire hazard at the Indian Head, Md., naval proving grounds, is adequately furnished by the equipment of an efficient fire car. An ordinary railroad flat car is used, this being towed over the network of tracks, with

which the hundreds of buildings are interconnected, by an electric trolley. The equipment includes hose reels, a search-light and four electric lights—one at each corner of the car for night illumination—extension ladders, and a large tool box containing nozzles, axes, rope, and other miscellaneous fire-fighting aids.

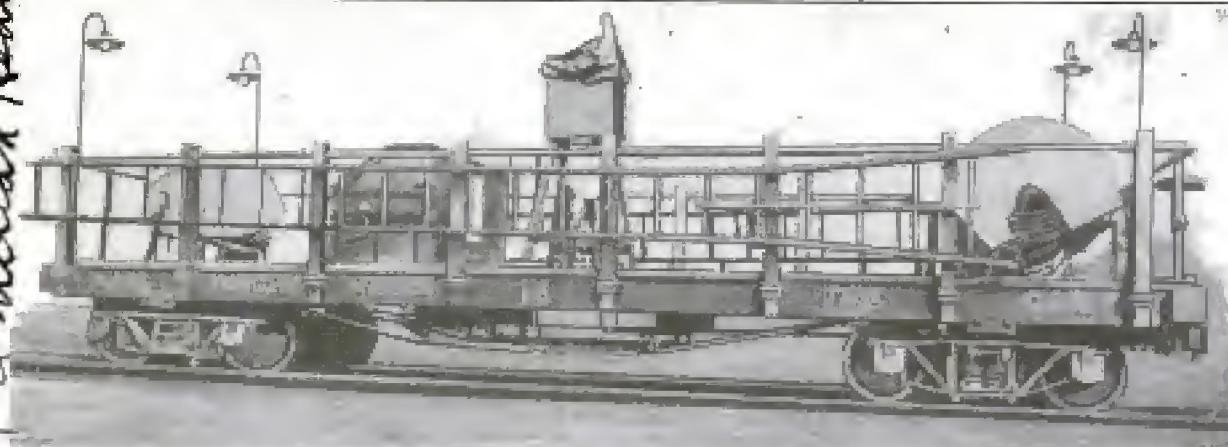
IMPROVED INSTRUMENT EASILY TESTS PAPER FINISH

Refinements in design have lately been accomplished in connection with an instrument for testing the finish on paper that enable this work to be done quickly and accurately by a comparatively inexperienced operator. As in the older instrument, it depends upon the principle that obliquely reflected light is polarized much the same as from a glass surface, but the sensibility and accuracy have been considerably increased. Aside from its use in the paper industry, it can be



Instrument Used to Determine the Finish on Paper, Furniture, Automobiles, and the Like, by Analyzing the Reflected Light

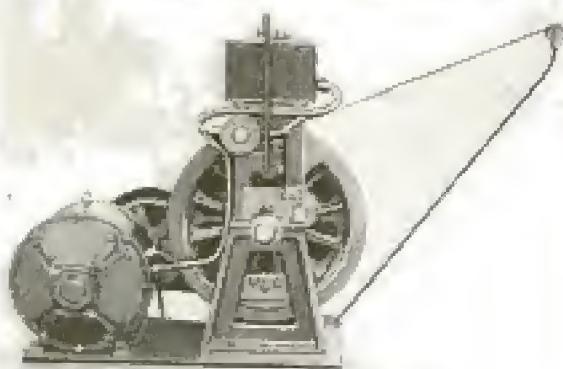
applied to measuring the finish on furniture, automobiles, and the like.



Fire-Fighting Equipment Mounted on a Railroad Flat Car at a Government Proving Ground, Showing the Large Electric Lamps and Hose Reels at Each End, While the Tool Box and Searchlight are Seen in the Center

Ent. P. G. & earliest Naval
Proving Grounds Indian Head

Central of universe, 460 S. Ohio St., Chicago

Nov 10⁵
norfolk Va.

Coast and Geodetic Survey Vessel "Pioneer," One of Two Converted Mine Sweepers, Each of Which is Equipped with a Motor-Driven Deep-Sea Sounding Machine: Above is Shown One of These Machines. The Motor, at Left, is Geared to the Drum, on Which 5,000 Fathoms of Wire can be Wound, and, with the Sounding Lead, Lifted at the Rate of 50 or 60 Fathoms a Minute



DEEP-SEA SOUNDING MACHINE THAT IS MOTOR-DRIVEN

In connection with the Coast and Geodetic Survey, the two newest vessels, the converted mine sweepers, renamed "Pioneer" and "Discoverer," have been equipped with a motor-driven deep-sea sounding machine in place of the customary steam-driven apparatus of this kind. A 2-horsepower electric motor is used to drive the drum, upon which 5,000 fathoms of fine steel wire can be wound. A 50-pound sounding lead is used, and with 1,000 fathoms of wire out, this weight can be raised at the rate of 50 or 60 fathoms a minute. The advantages claimed for the machine are simplicity and the ease with which it is operated.

ONE HUNDRED FEET OF FILM FINISHED AT SAME TIME

The developing, rinsing, fixing, and washing operations necessary in photography, have been facilitated by the introduction of a new film holder. This appliance consists of four racks placed on top of each other and held in position by a rod passing through their centers. The racks have evenly spaced bars, mounted vertically and extending diagonally across them from one corner to

the other. The films are wound around the bars with the sensitized side away from the metal, thus preventing any effacement of the coated part. Perforations in the racks permit the liquid being used to flow freely so that it will reach every part of the film, of which 25 feet may be wound on each set of bars.



Top: Four Racks Wound with Film and Ready to be Placed in the Developing or Other Solutions. Bottom: Four Bare Racks, Showing the Spacing of the Bars, the Perforations in the Bases, and the Long Center-Rod Support.

char. José E.R.
Jerra,
Ponce, Porto Rico

LEVEL INDICATOR ADAPTABLE FOR VARIOUS LIQUIDS

In the type of gauge which indicates the depth of a fluid contained in a tank by means of a counterbalancing column of mercury, an improvement has been made which permits the use of the same gauge in connection with liquids of various specific gravities.



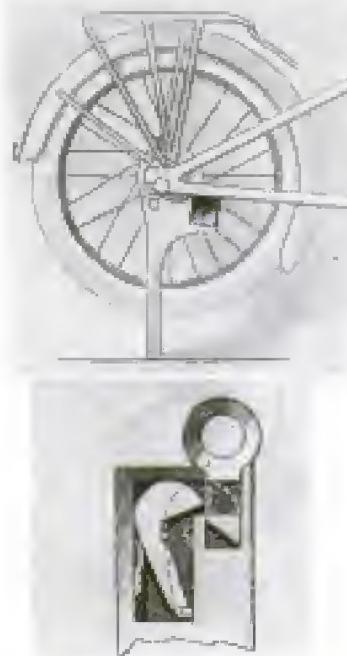
The improvement consists of a chart attached to the gauge, which has upon it a number of scales, marked at the top with certain specific gravities, and along their length graduated in feet.

For use, the proper scale, according to the specific gravity of the fluid, is lined up with the gauge glass, and the height of the mercury column will then indicate the depth of the fluid in the tank, in feet, or, with the tank area known, the quantity in cubic feet. Provision is also made for the attachment of an electric minimum and maximum-depth alarm. A check valve, located at the top of the instrument, serves to prevent the mercury from being blown out of the gauge glass,

in case the instrument should, for some reason or other, be subjected to an over-pressure.

MOTORCYCLE LOCK CONNECTED TO ITS SUPPORTING STAND

As a safeguard against theft, a motorcycle lock that is automatic in its action makes it impossible to move the machine under its own power or even to tow it away. The lock forms part of a supporting stand that can be attached to any motorcycle.



When the motorcycle is raised on its stand, automatically snaps into locking position and cannot be released without the use of a key. To make it possible to raise the supporting stand from below the wheel, the key is inserted and turned, moving the locking bolt out of engagement.

A huge airplane fitted with essential office equipment and a radiotelephone room, is being built for a wealthy Londoner, who will conduct business while traveling twice as fast as an express train.

NOVEL MANNER OF BUILDING AN IRRIGATION DAM

By O. JOHNSON

FOR the irrigation of 400 acres of arable land in the valley of the mountainous region near the town of Cromwell, in the province of Otago, New Zealand, the Kawarau River has been dammed in a very novel manner. The river, at the spot where the dam was to be built, is very narrow and rapid, with steep rocky banks. It was not possible to build the dam in the usual way, and instead two large columns of reinforced concrete, one on either side of the river, were built. One was 16 feet square and

46 feet high, and the other 13 feet square and 36 feet high. At the base, these columns were notched out in the way an axman cuts the trunk of a tree in felling it in a certain direction. Charges of dynamite were exploded under them, one after the other, and they fell end to end across the stream. Behind them a backing of stone hewn from the rock banks was built up, and mixed with concrete, until the level of the water was raised above the intake of a raceway, cut out of the solid rock and in places lined with

Cromwell Development Co.
Otago, New Zealand.



One of the Columns is Seen Here Just as It Falls into the River, being Broken at the Notched Point by a Charge of Dynamite. The Standing Column Shows Where the Notch was Cut

concrete walls. This raceway is three-fourths of a mile long, and will carry the water to a point from which the whole of the flat can be irrigated by gravity flow. The flood-gates and spillways in connection with this part of the work are completed, and there is now being built a power house containing turbines that will generate 700 horsepower for driving centrifugal pumps.



View of the Part of the Raceway Where It Enters the Power House, the Top of Which is Seen in the Immediate Foreground



Left: View Showing the Rough and Rocky Nature of the Country, Which Presented Many Dangers in the Way of Rock Slides. The Huge Stone Lying across the Cutting is Provided at One End with a Concrete Support. Right: Inside View of the Raceway near the Intake, Showing the Gates

The Auto Cooker Co.
 564 97 Island Park
 Rochester, N.Y.
 AUTO EXHAUST-PIPE COOKER
 HAS THREE LARGE PANS

98/5

Three large pans, allowing a diversified menu for a good-sized party of tourists, are contained in a new auto cooker which is heated by the exhaust. The cooker is



In the Illustration Above, the Cooker, Which is Heated by the Exhaust Pipe, is Shown Disassembled. Notice the Large Size of the Pans. On the Right, the Cooker is Shown in Its Regular Position Just under the Radiator Cover



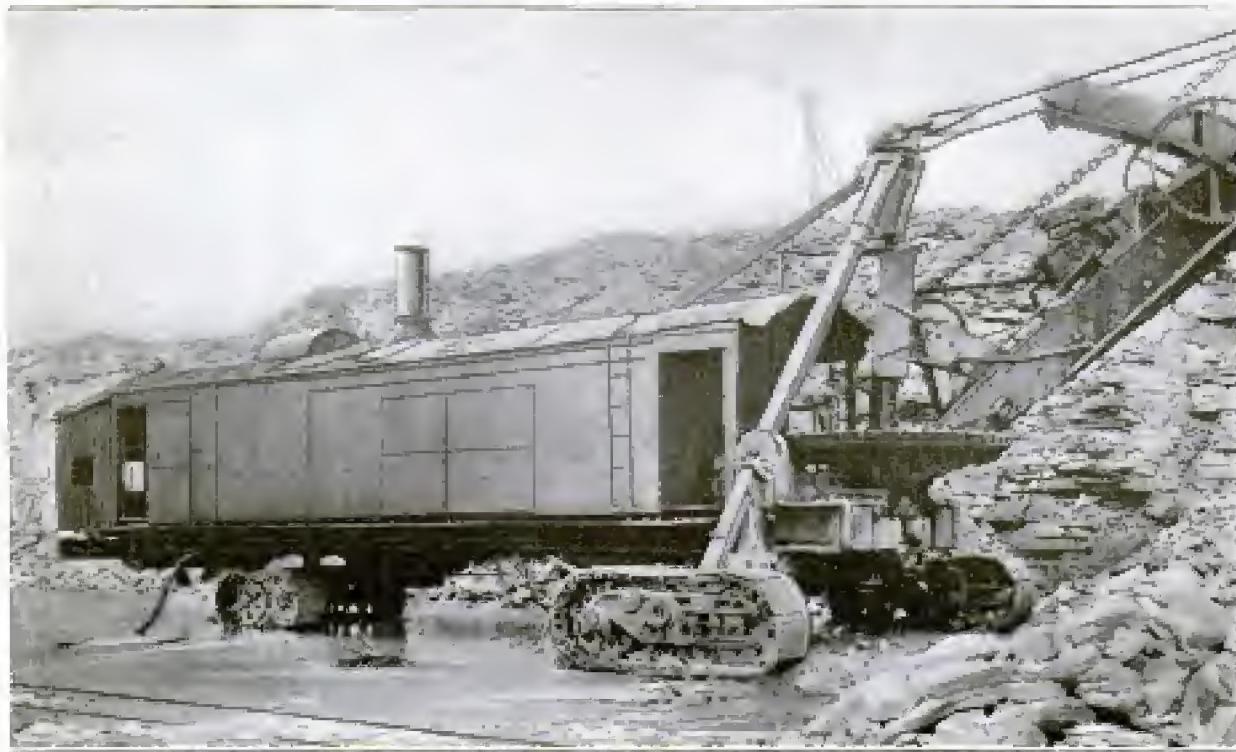
made especially for a popular lightweight car, and is clamped in place under the hood. It is not necessary to heat either the food or any kind of radiator first.

The Bucyrus Co.
 MECHANICS South Milwaukee
 WIS.
 ENDLESS-TREAD TRACTION RIG
 FOR STANDARD SHOVELS

Heavy excavating machinery, mounted on endless treads instead of wheels, has demonstrated its superiority to such an extent that a keenly felt want is met by the recent production of traction attachments of this type to replace the trucks and wheels of the older machines. In this way owners of shovels, still serviceable from other viewpoints, can realize the advantages of the newer equipment at a relatively slight expense.

Propelling can be accomplished by either endless tread or both working together, either forward or backward, at a speed of about $1\frac{1}{2}$ miles per hour, and is sufficient to enable the shovel to climb a 15 to 20-per-cent grade.

The recognized advantages of this type of traction are, that the operating field of the shovel is not confined to rails, which have to be laid, taken up, and relaid many times, and always give trouble in wet and cold weather; that it can be turned and does not have to face the blasting; that there are no supporting jacks to release and set, and no delays in operation from this source, and that the shovel is always in position to work most effectively. Furthermore, in an emergency such as a slide, the shovel can move itself out of danger, and there is no need of blocking under rails when working in soft ground.



Heavy Steam Shovel in Which the Standard Trucks and Wheels for Rail Service have been Replaced with Endless-Tread Traction Attachments, at Relatively Small Cost

9900. Dr. Frederick B. Ha Horge,
Bureau of Chemistry, Department of
Agriculture, Washington, D. C.
⁷⁶⁵
CORNCOB SEEN AS SOURCE OF NEW INDUSTRY.

Six years of persistent research at the Bureau of Chemistry of the Department of Agriculture, has resulted in establishing the fact that a number of interesting and useful by-products can be derived from the humble corncob. Chief among these is a colorless oily liquid called furfural. One of its attractive possibilities is as a fuel for automobile engines and similar motors, where experiments indicate it can be used by the addition of a more volatile liquid, without modification of engine or carburetor design. This work has shown that another use of furfural would be as a cheap and satisfactory substitute for formaldehyde, as used in combination with carbolic acid in making a synthetic compound which is used for the manufacture of phonograph records, varnishes, pipe stems, parts for electrical appliances, buttons, and the like. Other valuable by-products from the corncob are adhesives, and a cob pulp which is suitable as a substitute for wood flour in the manufacture of dynamite, or as a fiber in the manufacture of paper pulp and artificial silk.

The equipment used and the methods of processing to obtain the fundamental derivatives are relatively simple. The corncobs are placed in a closed container and cooked for two hours in the presence of steam at about 135 pounds' pressure. The resulting liquid is then freed

from the pulp and distilled, so that, in condensing, the furfural is separated from the water. Following small-scale



Stills and Condensers of the Development Unit Used by the Bureau of Chemistry, Department of Agriculture, in the Extraction of By-Products from Corncobs

production by the government development unit at Arlington, Va., the department has made a survey of the regions where corn is extensively grown, to ascertain where factories could be located to support a production involving 100 tons of cobs per day, within a radius where transportation charges to the plant would be reasonable.

172
COMBINATION FOUNTAIN PEN
AND REFILLABLE PENCIL

A self-filling fountain pen and refillable lead pencil, having all the good qual-



Combination Fountain Pen and Refillable Pencil, with Removable Cap Which Fits on Either End

ties of both, have been combined in one article. The barrel of the pen has the ink capacity of an ordinary fountain pen of the same size and is filled in a similar manner, while the pencil part contains a reservoir of seven standard-size leads.

When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.

Dr. Wm. Albin
1321 N. La Salle, Chicago

CIVIC FEATURES THAT PROMOTE THE COMFORT



A Beautiful Rosebush Climbs the Trunk of This Tree in Santa Rosa, California. Running Nearly to the Top, More than 20 Feet above the House, the Bush Is Said to Be One of the Tallest Known.



Magazines Formerly Thrown Away by Departing Hotel Guests are Now Collected by a Society of Women in Portland, Oregon, and Distributed to Poor Families



In the Public Parks of Fargo, North Dakota, City-Library Magazines are Placed for Reference in Specially Made Boxes Nailed to the Trees



**FOOLS BEWARE ANGELS
AT RAILROAD CROSSINGS.**

This Large Sign near Olympia, Washington, is Strung between Two Telegraph Poles above the Highway, Close to a Dangerous Crossing. It is Strongly Illuminated at Night

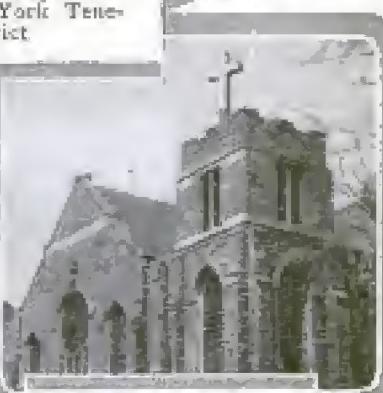
AND ENJOYMENT OF VISITORS AND RESIDENTS



More than 200 Young Children were "Checked" for a Two-Weeks' Vacation at a Summer Camp near Oakhurst, New Jersey, by a Charitable Day Nursery of the New York Tenement District.



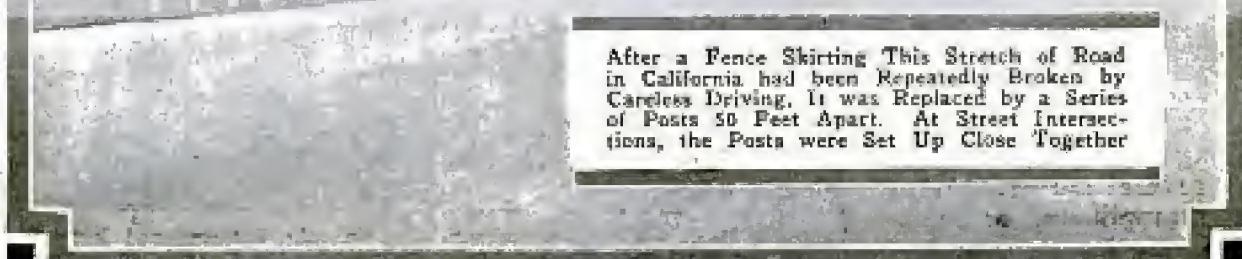
The "Bandit Squad" of the Philadelphia Police Force Now Use High-Speed Motorcycles and Sidecars, and Carry Repeating Guns.



This Revolving Cross on the Steeple of a Church of Wilkinsburg, Pennsylvania, Emits Flashes That Are Visible for Miles.



After a Fence Skirting This Stretch of Road in California had been Repeatedly Broken by Careless Driving, It was Replaced by a Series of Posts 50 Feet Apart. At Street Intersections, the Posts were Set Up Close Together.



H.C. McLeod, 1717 St. Paul St.
Baltimore, Md.

768

POPULAR MECHANICS

9760

METHOD TO PROTECT ROOTS OF IMPERILED TREE



BY COURTESY OF THE AMERICAN FOREST ASSOCIATION

Earth-Filled Channels were Formed to Protect the Roots of This Tree Where They Crossed the Excavation for the Foundation

9869

BAND WITHOUT INSTRUMENTS IN STUDENT PARADE

Mystifying the onlookers, a recent student parade at the University of Wisconsin, at Madison, furnished excellent band music in spite of a "conspicuous absence" of any instruments. The answer to the puzzling phenomenon was radio. The drum major carried, instead of the usual baton, a pole with antenna wires which extended over the heads of the marchers to a similar pole borne at the rear. The receiving set and batteries were placed on a litter and carried along under the antenna by several students, with two amplifiers, or loud-speaking horns, complet-

ing the outfit, which certainly presented an unusual appearance.



Parading Band without Instruments, Showing the Batteries and Receiving Set on the Litter, the Amplifying Horns, and the Portable Antenna

When recent road-improvement work in New York City threatened the life of a beautiful large elm tree, special methods were adopted to protect the tree without interfering with the road work. Where the great roots crossed the excavation for the foundations of the new retaining wall, the earth was carefully scraped away from them, and they were wrapped in jackets of straw to preserve their moisture. Wooden sheeting was then driven vertically on each side of the roots to be protected. The channels formed between the rows of sheeting were filled with earth, and the concrete for the foundations was poured in the remaining spaces. Old steel rails, set on piers, were placed over the roots to protect them from excessive pressure.

¶A native Paraguayan herb named "ka-a he-e," possesses sweetening properties that are said to be from 150 to 200 times greater than those of sugar cane, in addition to which the herb is soluble in water and does not ferment, these merits obviously being of value commercially.

New York
May, 1912

Mr. Milton C. Lloyd
10/2 Creative Sh

POPULAR MECHANICS

769

RAT-EXTERMINATION PROBLEM q946 TURNED INTO SPORT

Rat extermination, periodically made the object of nation-wide campaigns, has recently been presented in a light which tends to give these activities a sporting



observed by experts who witnessed the test, that the plane flew just as well as with gasoline, that there was less vibra-



Rat-Extermination Contest.
Showing the Dogs
being Held in Leash at the
Left of the Long Runway, While
at the Extreme Right, the Rodent is be-
ing Dropped from a Cage into the Wire Enclosure

aspect. The innovation originated in St. Joseph, Mo., where a number of dog fanciers arranged a contest to determine the respective speed and rat-catching ability of their fox terriers. The method employed was to build a semicircular inclosure of wire netting, 25 feet in diameter, 4 feet in height, and with a 10-foot opening at one side. Leading away from this opening was a runway, or race track, for the dogs, about 500 feet in length, at the end of which the eager animals were held in leash. Over the center of the inclosure, a rat was suspended in a cage which could be opened by pulling on a string. At a given signal, the rat was dropped to the ground, and simultaneously the fox terriers were released, the latter immediately making a dash for the luckless rodent. Three heats were run to each race, the first dog crossing the line at the entrance of the inclosure receiving a credit of six points; the second dog, four; third dog, two, and the one catching the rat, two. Great sport for all parties concerned—except the rats!

242 USE PETROLEUM AS FUEL aeronautics FOR AIRPLANE MOTOR

What appears to some as an epoch-making event in the development of airplane and automobile motive power, is the recent successful trip near Copenhagen, Denmark, of an airplane using petroleum as engine fuel. Interest in this centers around the carburetor of the so-called dry type, an invention of a Dane, and which was attached to the 150-horsepower engine of the plane, although designed for only 80 horsepower. It was

tion and no soot formed, nor was there any self-ignition in the engine, which ran 100 less revolutions than normally. Petroleum costs a third as much as gasoline and has more heat units per gallon.

9809 METAL CAMP-FIRE STAKE HAS THREE ADJUSTABLE RACKS

Three adjustable racks, which may be turned, raised, or lowered according to the direction of the wind and the height of the flames, are attached to a metal stake designed for camp-fire cooking. One



Stake for Cooking over the Camp Fire; The Brackets on the Stake may be Turned, Raised, or Lowered

of the racks is intended for roasting, another holds a frying pan, while a coffee-pot may be hung from the third.

Names and addresses of manufacturers of articles described in this magazine will be furnished free by our Information Bureau.

Aerial Age 9/1922

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



INTENDED FOR THE HOME AND ITS MEMBERS



Electric Frying Pan Constructed of Heavy Spun Steel for the Preparing of Eggs, Chops, and the Like, at the Table.



Strainer Funnel Having Adjustable Screens Which can be Easily Interchanged



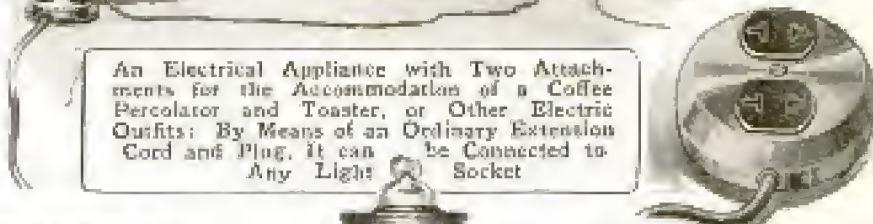
Belt Buckle Which may be Easily Taken Apart for Slight Adjustments of the Belt, as Shown to the Left



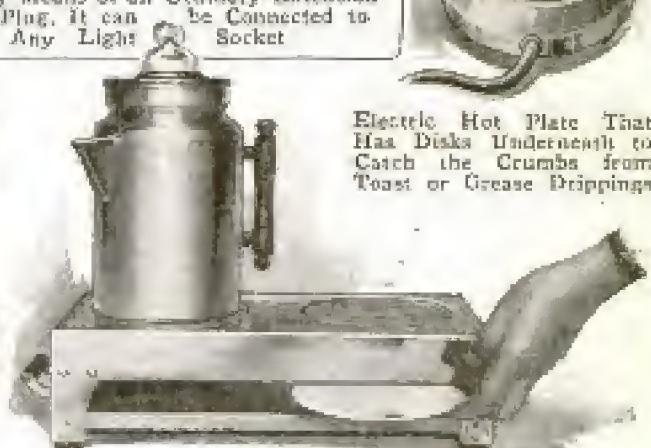
Window Brush Which Has a Small Water - Filled Compartment That Washes and Rinses at the Same Time



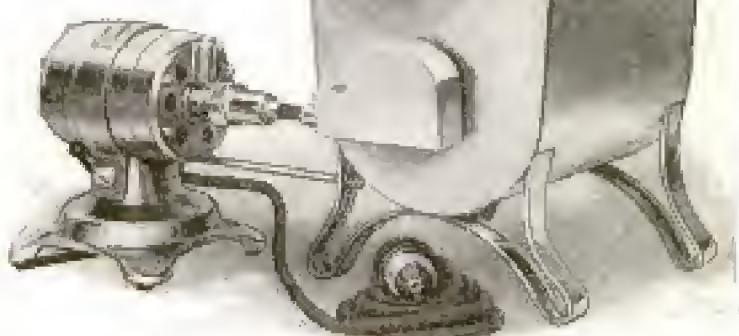
An Electrical Appliance with Two Attachments for the Accommodation of a Coffee Percolator and Toaster, or Other Electric Outfits: By Means of an Ordinary Extension Cord and Plug, It can be Connected to Any Light Socket



Electric Hot Plate That Has Diska Underneath to Catch the Crumbs from Toast or Grease Drippings



This Motor-Driven Cream Whipper Saves Considerable Labor, and can be Quickly Attached to Any Ordinary Lighting Circuit

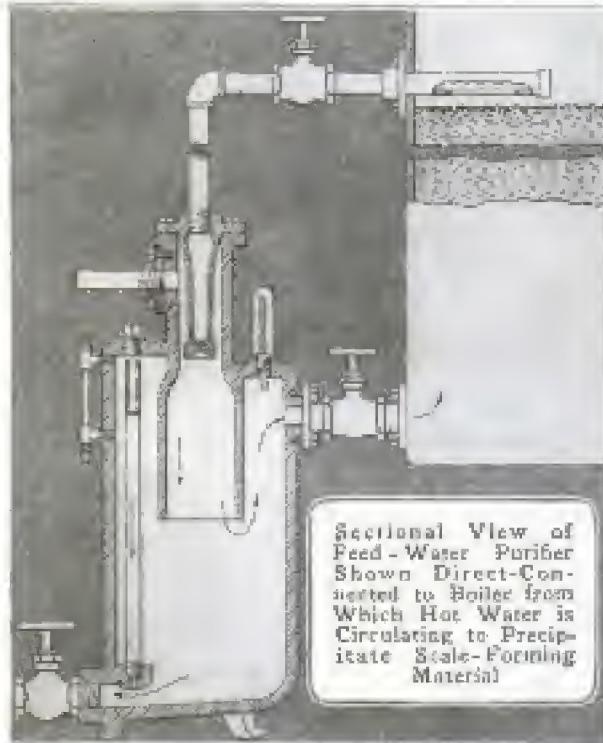


Draw. C. E. Sargent
909. 20th St.
772 Rockford, Ill.

BOILER FEED-WATER PURIFIER REDUCES SCALE TROUBLES

984

A new device for overcoming the troubles arising from impure water in boilers precipitates the scale-forming materials before the water enters the boiler. A



pipe, entering the boiler slightly above normal low water, has a slot underneath, through which water can pass out and into the purifier by way of an injector nozzle and downwardly opening bell. Raw water entering near the top of the heater, in passing down around the nozzle and through the bell, is heated sufficiently to deposit the foreign matter at the bottom, where a suitable blow-off is located. At a connection between the body of the purifier and the boiler, water enters the boiler below low-water level. The purifier is equipped with a gauge glass and thermometer.

CITY PROVIDED WITH MUSIC

BY BOY SCOUTS' RADIO

Installation of radio apparatus in a city-park band stand, from which music received from various parts of the West was amplified for the audience, was the venture originated by Boy Scouts in Twin Falls, Ida. The radio concerts proved such an immediate success, that those of the ordinary band variety were abolished, the enterprising youths being given full rein, as well as financial assistance, in their endeavor.

Henry H. Graham
56 S. 20th Ave.
Twin Falls, Idaho

Tolson's Engineering
Co., Sheffield
MECHANICS
England.

LARGEST ARMOR-GRINDING MACHINE IN THE WORLD

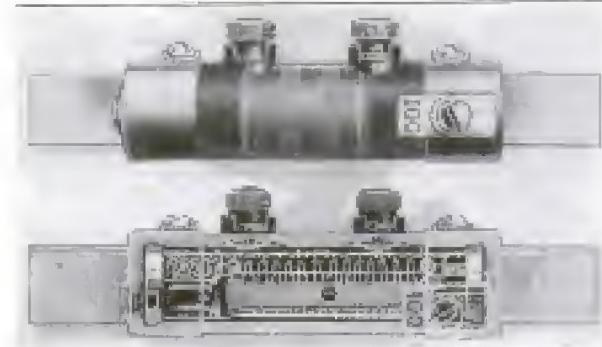
178

What is said to be the largest grinding machine ever made has been produced in Sheffield, England, for grinding the edges of naval armor plates. An unusual feature of the machine is that it does this grinding with the flat face of the wheel instead of with the periphery. The grinding disk is 54 inches in diameter, made of cast steel, and is divided by arms into sections filled with a grinding material, such as carborundum. Making 200 revolutions per minute it takes 120 horsepower to drive it. The total weight of the machine is 60 tons.

POLYPHASE MOTOR PREVENTED FROM SINGLE-PHASING

96

Polypahse motors in electric circuits are subjected to serious damage through "burning out," when a fuse on one phase "blows," thus permitting the heavily loaded motor to run on but a single phase of the current. Numerous protective appliances, such as circuit breakers, overload relays, etc., have been designed to overcome this trouble, but owing to the unstable character and surges of alternating current, these do not always operate satisfactorily. The introduction of a renewable fuse, which has a small heat coil incorporated in it, seems to have effectually solved the problem, however. These fuses are placed in a polypahse circuit in the usual manner, but the heat coil in each is connected across one of the other fuses. Therefore, if one phase receives a surge of current and blows its particular fuse, the current ordinarily flowing through this fuse immediately passes into the heat coil of a fuse in another phase. The heat resulting from the coil melts the second fuse, thereby killing the line and stopping the motor.

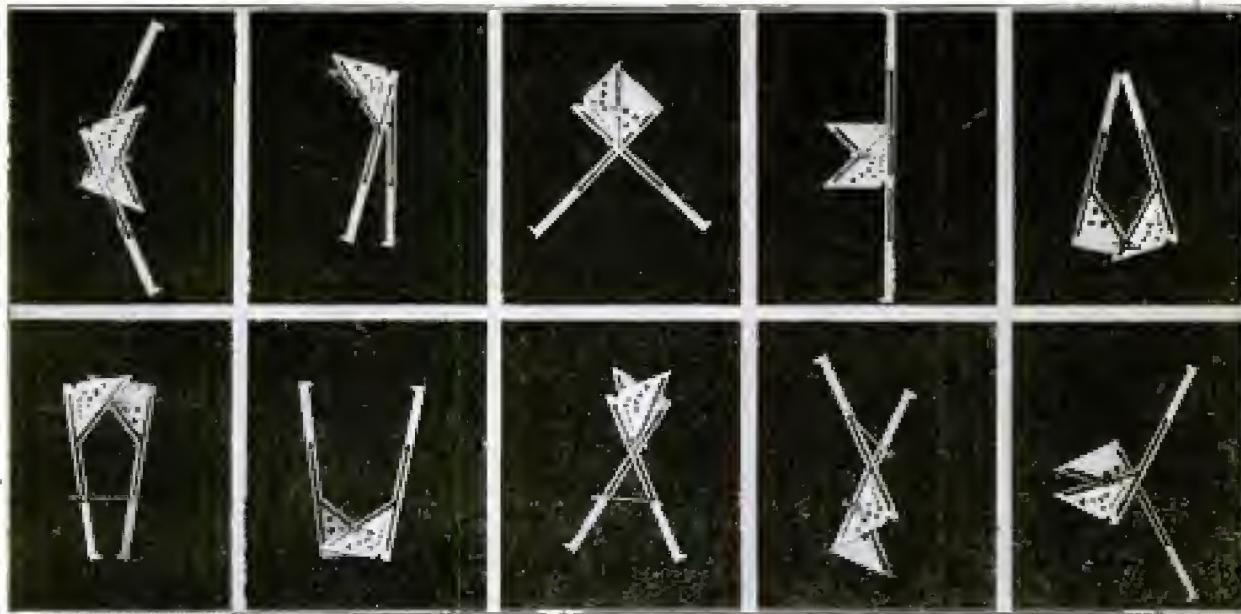


Top: Renewable Fuse, Showing the Terminals of the Heat Coil. Bottom: Phantom View of Fuse, Showing Location of Heat Coil

Mr. Federal Electric Co.
Copyrighted material
72 W. Adams, Chicago

Don't sleep

Cale.



Reading from Left-to Right, 10 Adjustments of the Measuring Instrument Are: Above, Bevel Protractor; Patternmaker's Caliper; Try Square; Inside Caliper or Straightedge, and Taper Gauge. Below: Two Forms of Outside Calipers; Inside Calipers; Extension Dividers, and Bevel Gauge.

ADJUSTABLE INSTRUMENT HAS NUMEROUS APPLICATIONS

For the use of mechanics in general, an instrument that is adjustable for making measurements of a very varied nature has been recently patented. It can be adjusted for use as outside or inside calipers, as dividers, as a bevel gauge or protractor, as a straightedge, as a right angle, or 45° square, and it has a set of holes to act as wire and tool gauges. When in use as inside or outside calipers, it has a screw attachment for making very fine adjustments.

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DOOR-LOCK STRIKE PLATE IS EASILY ADJUSTABLE



An adjustable door-lock strike plate is made with an outer and inner plate so that the latter can be raised or lowered when required, to take care of any settlement that may occur in the door frame. To adjust this inner plate, in which are the openings for the latch and lock bolt, all that is necessary is to loosen the two screws that hold the outer plate, and after adjustment to retighten them.

HEATER VAPORIZES THE HEAVY PARTICLES OF GASOLINE

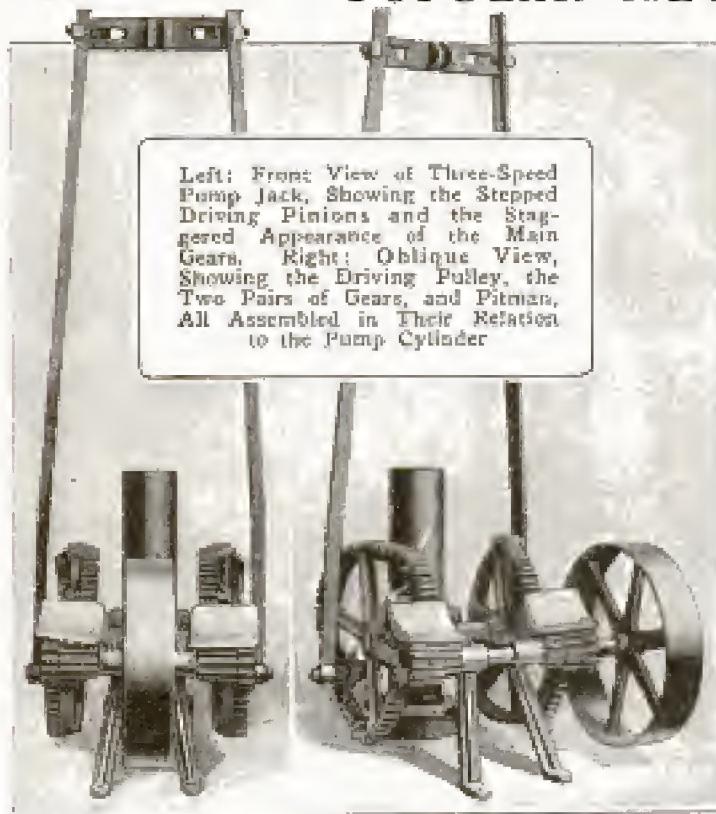
113 It is claimed the drawbacks of other heating devices have been overcome in a new design to completely vaporize low-test gasoline. The idea is not to heat the gas already vaporized by the carburetor, which heating would lower the efficiency of the engine, but only to apply heat to vaporize the particles of gasoline that are permitted to drop into a chamber surrounded by exhaust gases. This vapor forms a relatively cool mixture with that from the carburetor, and enters the engine without fouling the spark plugs, or diluting the crankcase oil, giving a reported increase in efficiency of 20 to 25 per cent. It does not require a new carburetor.



An American manufacturing company has inaugurated a departure in the transporting of rubber latex, or liquid, by mixing this product with a chemical to keep it from coagulating, and then carrying it from the Malay Peninsula to this country in tank steamers.

*Rahide mfg. Co.
2621 Vine St.
Milwaukee Wis.*

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THREE-SPEED AUTOMATIC
PUMP JACK

Left: Front View of Three-Speed Pump Jack, Showing the Stepped Driving Pinions and the Staggered Appearance of the Main Gears. Right: Oblique View, Showing the Driving Pulley, the Two Pairs of Gears, and Pitman, All Assembled in Their Relation to the Pump Cylinder

An ingenious pair of gears forms the interesting part of a new pump jack. The smaller gear, or driving pinion, is made with three different diameters, giving it a stepped appearance, each step being the same width as the larger or driven gear, which is of varying diameter and presents a staggered appearance, in order to correspond properly with the different steps on the pinion, at designated points in the pump cycle. The idea of this speed changing is to balance the work done in the different parts of the pump strokes, which has a tendency to reduce the power required to drive the pump. The changes are automatic and gradual, thereby giving a very smooth motion and eliminating undue strain on the pump.

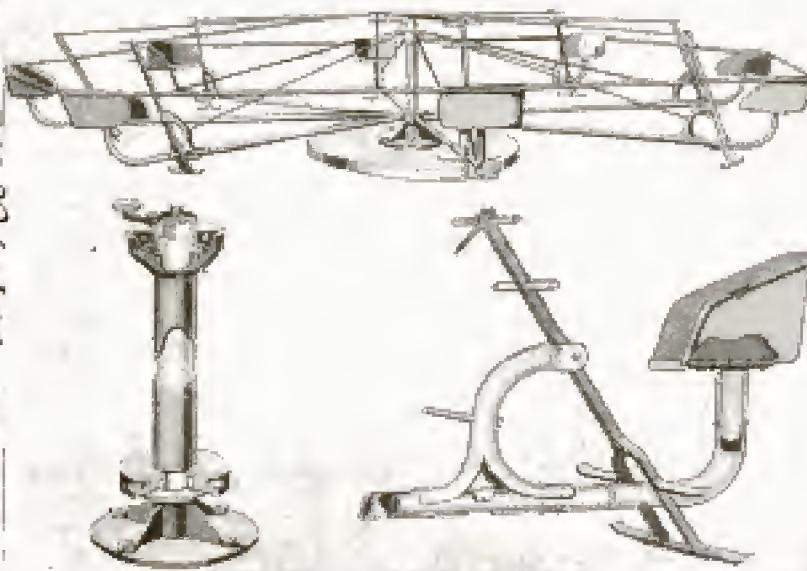
SAFE PLAYGROUND APPARATUS
MAKES EXERCISE A JOY

A new piece of playground apparatus, now on the market, combines the features of a tricycle and a merry-go-round. It can be operated by two or more persons, who push with their feet and pull with their arms. There are no gears, chains, or traps to become entangled in, and the centrifugal action of the swing tends to

hold the child more securely in its seat. A steel band, encircling the swing, adds strength and safeguards bystanders from stepping between the seats while the swing is in motion.

CHANGES IN LIBERTY MOTOR
RECTIFY FORMER DEFECTS

Changes in the Liberty motor have been made by naval experts that have resulted in making possible long-distance airplane flights without even so much as the changing of a spark plug. As is well known, the original Liberty motor had several faults, the most serious of which was the failure of the timing gears. This was first remedied by redesign. Additional grooves and holes in the pistons prevented oil from getting into the combustion chamber, and causing spark-plug trouble. The ignition system was greatly improved by substituting a 12-volt for the original 8-volt system. With these changes flights have been made of 25 hours' duration.



Above: Moving Part of Playground Apparatus, Showing Arrangement of Seats. Lower Left: Pedestal Support. Lower Right: Close-Up of One of the Seats, Showing Propelling Mechanism

Williams Gearless Circle of Seats Am. Mfg. Co.
110 2nd Ave. New York

*n-y Junes
O. 6, 7/5/12*

Christian Science

Monitor 8/1/92

POPULAR

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PENINSULA OF SOUTH AFRICA ENCIRCLED BY A DRIVEWAY

For several years work has been in progress upon a roadway to encircle the entire peninsula at the southern extremity of South Africa, upon which Cape-town is situated. The roadway is now completed, and at the opening ceremonies, last May, it was claimed to be the finest marine drive in the world, surpassing even the famous Corniche Road, at Mentone, in the south of France. The road is 125 miles long, and for most of its length is hewn in the rocky sides of the mountains that tower over the entire seacoast of the cape.

102 SMALL POUCH FOR MAILING SOUVENIR CARDS

Made in the form of the regular U. S. mail pouch, a miniature bag for the inclosure of photographs or souvenir cards has been put on the market. A tag for the addresses of the sender and recipient



Small Bag, Constructed after the Pattern of a Government Mail Pouch, for Use in Sending Souvenir Post Cards

is attached, and the pouch is mailed at the regular rate of postage. A note or letter may, therefore, be inclosed with the pictures.

998 7 PUREST ICE MANUFACTURED ECONOMICALLY

At a famous sanitarium in the Swiss Alps, a simple method is in use for the economical production of pure ice. The ice plant consists of a structure having four upright posts, about 10 feet long, arranged in a square with 4-foot sides. Cross timbers at the top form a skeleton roof. A 1-inch steam pipe connecting with the boiler room, rises up one of the posts and terminates in a nozzle near

Sanatorium Clavadel,
Levico Plate,
MECHANICS 573
Switzerland

the top of the structure. Steam from the nozzle is projected against the underside



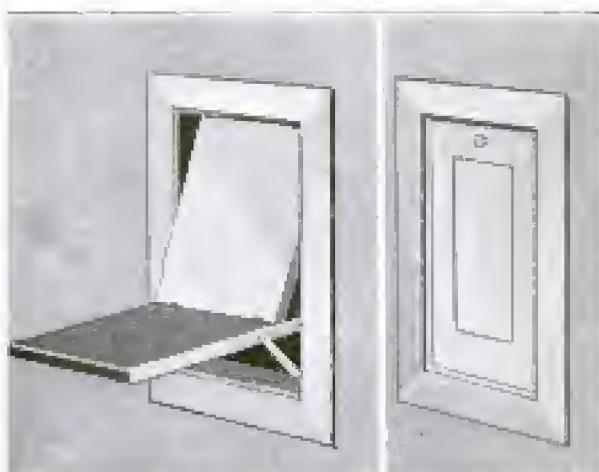
Simple Arrangement Used to Obtain Pure Ice at Low Cost in the Swiss Alps

of the roof timbers, where it condenses and forms into icicles, which are later broken off and stored.

3

CONVENIENT BATHROOM SEAT FOLDS INTO WALL

Convenience and economy of space are aptly illustrated in a recently introduced bathroom seat, which can be folded into the wall when not in use. The seat is the door of a small cabinet that can be fitted between two of the wall studdings in any ordinary house, thus not taking up any valuable room when folded.



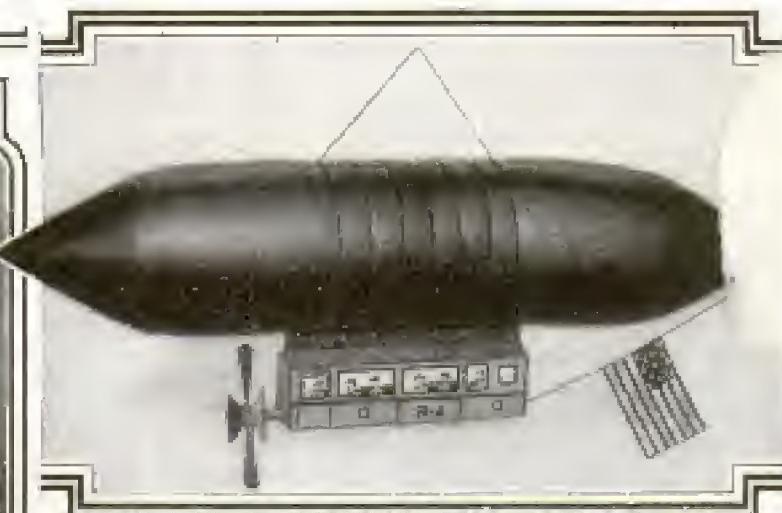
Left: Bathroom Seat Shown Pulled Out of the Wall Ready for Use. Right: Seat Folded Back into Cabinet

*Murphy Floor Bed Co.
2210 Monroe Street
Chicago*

CHILDREN'S PICTURE-STORY DEPARTMENT



Of All Nests, a Humming Bird's Is the Hardest to Find, Both on Account of Its Smallness and the Cunning Way in Which It is Hidden. Here Is One That was Not Only Found but was Also Photographed—Mother Bird and All.



This Toy Dirigible Balloon Comes to the Home Folded Up and Packed in a Flat Envelope. Instructions Come with It, Explaining How to Convert the Folded Parts into a Car with Propeller and Connections to the Gas Bag After It is Inflated, When It Measures 24 Inches in Length and 5 Inches in Diameter.



Here Are Two Gophers—Usually the Shiest of Animals—Apparently Posing of Their Free Will for the Photographer. The Picture was Taken in British Columbia.

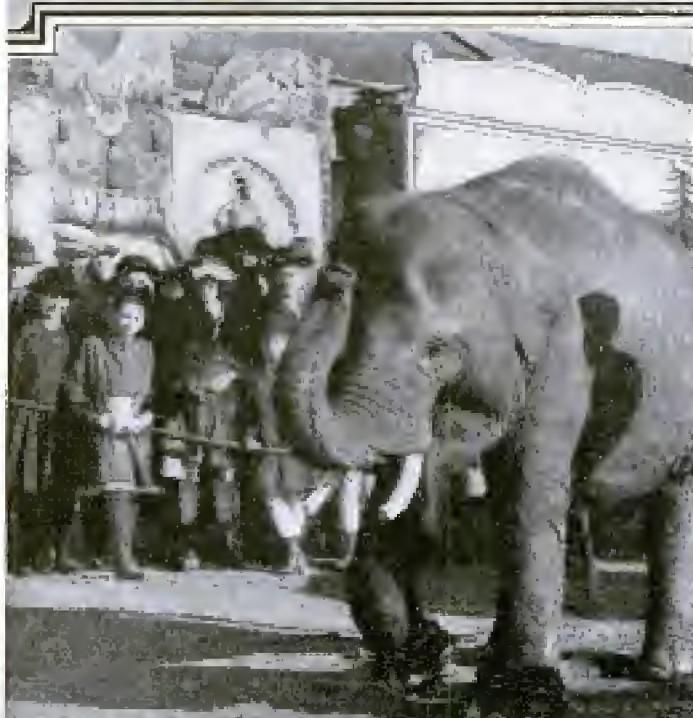
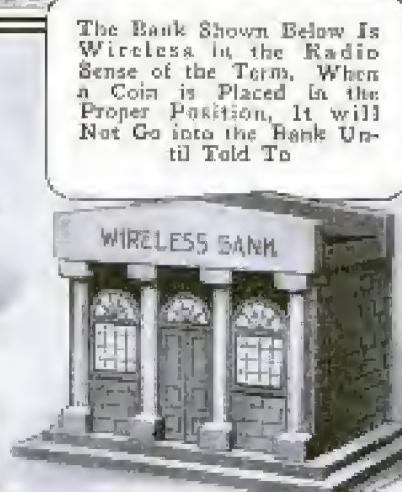
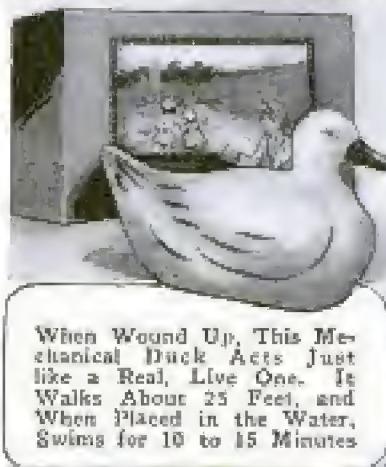


These Orphan Lambs Have Certainly an Excellent Foster Mother, with No Danger of Running Short of Nourishment—Quite the Contrary. This Unusual Family Scene was Photographed in a Little Out-of-the-Way Town in the Province of Quebec, Canada.

OF MODERN ACTIVITIES AND INTERESTS



Florence Fronde, of San Bernardino, California. Only 6½ Years Old, Looks Sturdy and Certainly does Not Helle Her Appearance, for Swimming with Her Hands Tied behind Her, She Towed the Boatload of Heavyweights, Shown at Left, a Distance of 50 Feet



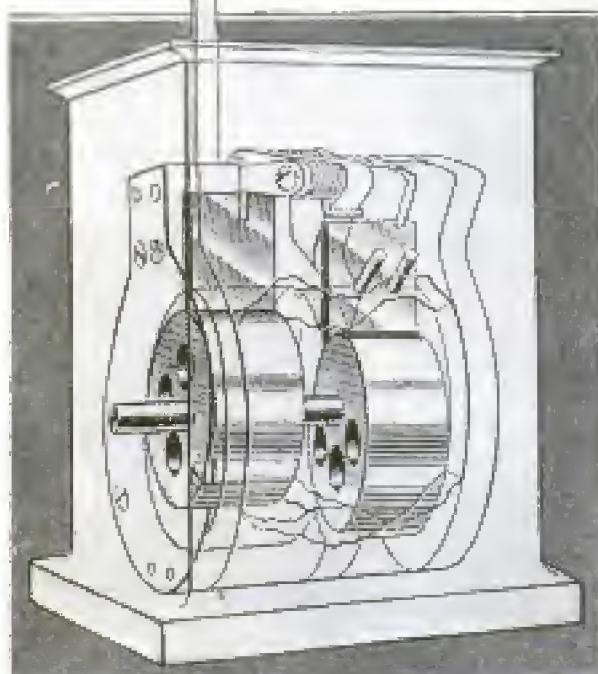
The Circus Elephant in the Foreground is Named "Billy Sunday," but His Namesake would Scarcely Approve His Behavior, for Here He is Caught in the Act of Doing the "Shimmy." The Picture Clearly Indicates That He Enjoys It as Much as if He Were Human.



Sold by
Central Scientific
98 & Supply Co. POPULAR
SIMPLE AND EFFECTIVE PUMP

CREATES HIGH VACUUM

With a new air pump of simple construction, it is possible to obtain a so nearly perfect vacuum that the pressure of the remaining air is only .001 millimeter, the normal open-air pressure being about 760 milli-



By Courtesy of the Author
High-Vacuum Pump for Laboratory Use, or in Places
Where Small Volumes of Air are Handled.
Shown in Phantom View

meters. It is designed for use in laboratories and other places where the quantity of air to be handled is comparatively small. A solid eccentric cylinder, balanced by being perforated on one side, rotates in a cylindrical shell provided with two openings. One opening leads to the chamber to be exhausted, while the other communicates with the atmosphere through a suitable valve. By means of a

The Lawrence Sperry
Aircraft Co., of Inc.
MECHANICS
Glenwooddale, L. I., N. Y.
spring and lever, a valve, sliding in a slot in the outer cylinder, is kept in constant contact with the rotor, and by this means, the latter and the outer cylinder always touch at two points, thereby dividing the pump chamber into two parts of varying capacity. The pump consists of two similar units mounted upon the same shaft, one serving as the preliminary to the other. The whole is mounted in an iron box, on the outside of which are pulleys from the common shaft for connecting to a motor of only one-tenth horsepower.

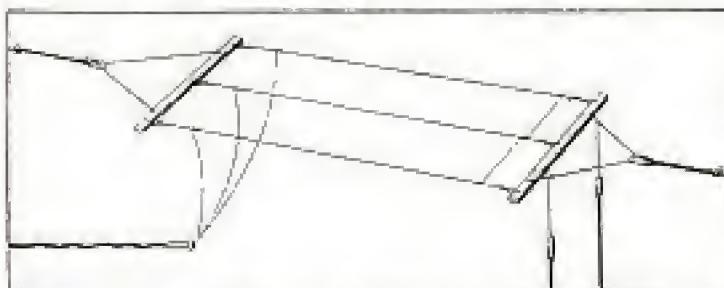
FLIGHT OF AIRPLANE SHOWN
BY GYROSCOPE INSTRUMENT

Handling an airplane in clouds or in a fog is uncertain because the earth, otherwise the means of checking direction and balance, is invisible. The compass is not steady enough, but a new instrument is used to assist the pilot.

A Venturi tube, placed in the air stream of the propeller, produces air pressure to drive a small gyroscope, to which it is attached by tubing, at 8,000 revolutions per minute. The gyroscope, on a lateral axis, is suspended in a frame hung in a fore-and-aft axis, movement about which is restrained by a spring. A turning or tilting motion of the plane influences the action of the gyroscope so that it is indicated on the face of the instrument.



READY-MADE RADIO AERIAL—NOW ON THE MARKET



Wireless Aerial That Is Complete in Every Detail, and
Which can be Erected in 10 Minutes, Shown
Stretched Ready for Operation

Complete in every detail and capable of being erected in ten minutes, describes a radio aerial, which is now available on the market. Specially treated copper wire, the joints of which are properly twisted and soldered, glazed-porcelain insulators tested for tensile strength, and kiln-dried, chemically prepared hardwood arms, are the essential features of the outfit.

Lawrence Radio Equipment Co.
7 Princeton Ave., Copyright 1921, by Louis M.

Shop Notes

Information as to where to obtain any specimen materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information—Editor.

How to Make Concrete Tile

By HJALMER LINDQUIST

FLOORING, wall facing, garden walks, etc., are some of the common constructions in which concrete tiles are used. These tiles are not at all difficult to make, and the results of their use are well worth the time expended.

When only a few tiles are wanted, the forms can be made from two pieces of board, tacked flat to a wide plank, with other pieces tacked between them at right angles, to divide the individual tiles. The nails with which the boards

of tiles are to be made, it will, of course, pay to have good forms ready beforehand so that the work can be done quickly.

The forms are filled with a wet concrete mixture of 3 parts sand and 1 part cement. Some kind of reinforcing wire should be placed in the center of each tile to strengthen it; a coarse wire mesh will serve the purpose. The form is half-filled with concrete, the reinforcing put in, and the rest of the cement applied until the



are fastened are only partly driven in, so that they can be easily pulled when the tiles have set. These forms should be squared, and the lumber from which they are made should have straight, smooth edges. If a considerable number

Upper Left: Coating the Tile Surface with Neat Cement. Upper Right: Simple Forms for the Production of the Tile. Lower Left: A Group of Finished Concrete Tiles.

mold is filled. A little care will be required to get the corners of the work square and sharp; all corners should be well tamped with a short wire. The concrete is "struck" off flush with the top of the forms by drawing a straightedge over them. The top surface of the tile is left rough. Cleaning the top edge of the form, next to the tile, with the point of a trowel, will help give the tiles a better appearance when they are dry.

When finished, the tiles should be allowed to dry, before they are taken from

the forms, preferably in the shade, as rapid setting is not advisable. They should then be soaked in water for about two days to harden them. After being removed from the water, they are allowed to dry overnight, and the top surfaces are coated with a neat cement, which is a mixture of cement and water, a little thicker than cream. Whipping the cement while mixing it seems to give a slight gloss to the work. A little of the neat cement mixture is spread over the tile surface and shaken into contact and smoothness by rubbing the bottom of the piece over a thin layer of sand sprinkled on a smooth surface. When the top coating has set for a day, the tiles should be placed in water for a day or two, then allowed to dry for a day before coloring.

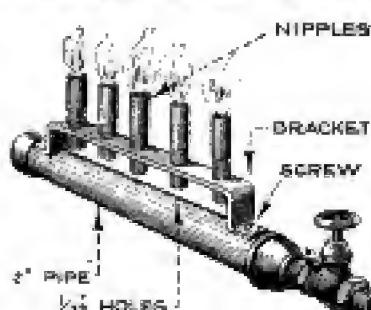
Coloring of the tiles is effected by inexpensive chemical solutions. A saturated solution of copper sulphate, or bluestone, gives a bluish-green color,

while a solution made from sulphate of iron or copperas produces a rust-red. By using a solution of either of these salts as a mordant, any of the dry cement colors can be used. The dry cement color is mixed with water to the desired shade, and then about $\frac{1}{2}$ part liquid measure, of either copperas or bluestone solution is stirred in. A syringe should be used in applying the colors; with this the colors can easily be varied and blended together on the surface of the work.

The tiles should be set in soft mortar, on a solid base, and the appearance of the work is often improved by spacing the tiles about $\frac{1}{2}$ in. apart and filling this space with colored mortar. To color the mortar, the dry colors can be mixed with it directly. The tiles shown in the illustration are about 7 by 14 in. and $\frac{3}{4}$ in. thick. Other sizes, of course, can be made in the same manner.

Gas Burner for Heating Furnaces

The high cost of gas-furnace burners led a householder to devise a burner that



is very easily made, and at the same time cheap and efficient. The burner consists simply of a flat-iron bracket fastened to a 2-in. pipe by a machine screw at each end. The burner tips screw into holes in the bracket, so that they can be adjusted individually to the proper distance from the small holes that serve as outlets for the gas.—John H. Schalek, Pittsburgh, Pa.

Strength of Douglas Fir and Southern Pine

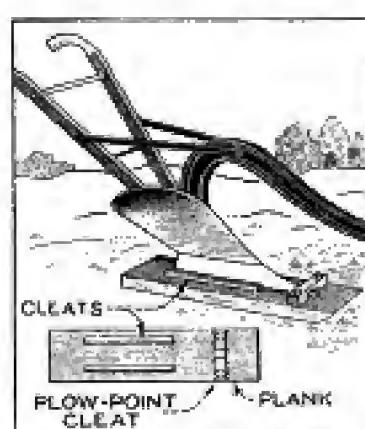
There is little difference between the strength of the southern pines and that of Douglas fir from the Pacific Northwest, as government tests show. True long-leaf yellow pine averages heavier, stronger, and tougher than Douglas fir. True short-leaf pine averages heavier and tougher than fir, but is about equal to it in strength when used as a beam or post. Loblolly pine, though averaging heavier than the fir, is somewhat weaker. The difference in strength between any of these pines and Douglas fir, however, is

not so great but that low-density pieces of the one species are weaker than the average for the other species.

As far as strength is concerned, the choice between any of two lots of southern pine and Douglas fir will depend upon the grade and density of each lot. The mountain type of Douglas fir averages considerably weaker than the Pacific-coast type.

Runner for a Plowshare

A shoe or runner, such as that shown in the drawing, will save a lot of time and energy when the plow is being taken to and from the field.



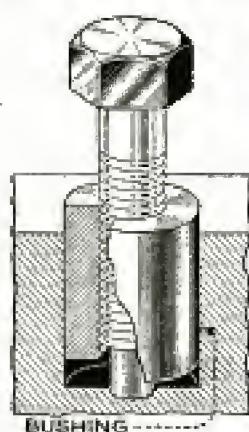
A thick plank of oak, or other hardwood, is provided with a cleat in which a notch is cut; this is fastened to the forward end of the shoe and the point of the plow inserted into the notch. Cleats nailed on either side of the share serve to prevent it from slipping off to one side. The front end of the shoe is beveled or rounded off, so that it will ride over any obstruction in its path.—F. H. Hanford, Detroit, Mich.

Antique Color for New Parchment

New parchment can be given the appearance of great age by soaking it in a 5-per-cent solution of potassium permanganate and then washing in clean water. The solution acts very quickly, and care must be taken that the parchment is not allowed to remain in it too long, or the color will be too dark. If the parchment should be a little greasy, wash it with soap and water, and rinse before placing in the permanganate solution. If the parchment is to be pasted to anything, as, for example, the covers of a book, fasten it to a board with thumbtacks and allow it to dry slowly.—Jean L. Martin, Paris, France.

Removing Bushings from Blind Holes

Although it is easy to install a bushing in a blind hole, its removal is an entirely different matter. The shopman is frequently called upon to remove such a bushing, and the method described may help when he meets with an obstinate case.

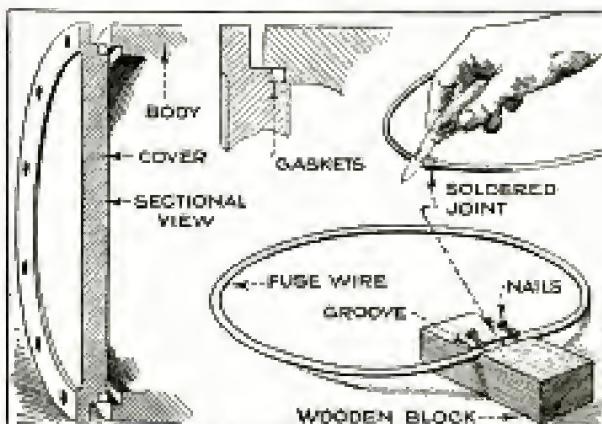


The bushing hole is first tapped, using a bottoming tap, and running it down to the bottom of the hole; this will thread all but a very small length of the bushing. An ordinary bolt with the same size thread as the tap is turned down or filed so that a portion of the end is smaller than the bore of the bushing. By screwing this bolt into the threads cut on the inside of the bushing, the end of the bolt strikes the back of the hole and the bushing is forced out. If the bolt screws into the end of the thread before the bushing is entirely out, the bolt may be removed and a small block placed below; this will usually give enough additional purchase to finish the job.

Fuse-Wire Gaskets for Tight Joints

Cutting gaskets from sheet lead, as usually performed, is wasteful, and it is also difficult to cut them uniformly without special tools. In addition to this, if the surfaces to be jointed are not true at all points, great pressure will be required to make the joint tight. On a small ice

machine, 40-ampere fuse wire was used instead of sheet lead, with entirely satisfactory results. A step was cut in the cover of the machine, as shown, and the wire laid in this step and cut so that the ends just met. A groove was then cut

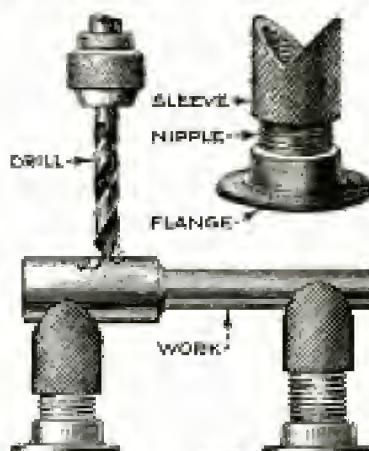


Fuse Wire Used Instead of Sheet-Lead Gaskets, in Ice-Machine Cylinder Heads: The Method of Jointing the Ends of the Wire is Shown at the Lower Right

in a small block of wood, and the ends of the fuse wire held together, in the groove, with small nails. Soldering paste was applied and the ends soldered, after which the joint was trimmed smooth with a pocketknife. With the lead ring in place, very little pressure was needed to make a gas-tight joint, as the wire squeezed out against all four sides of the joint.

Adjustable V-Blocks from Pipe Fittings

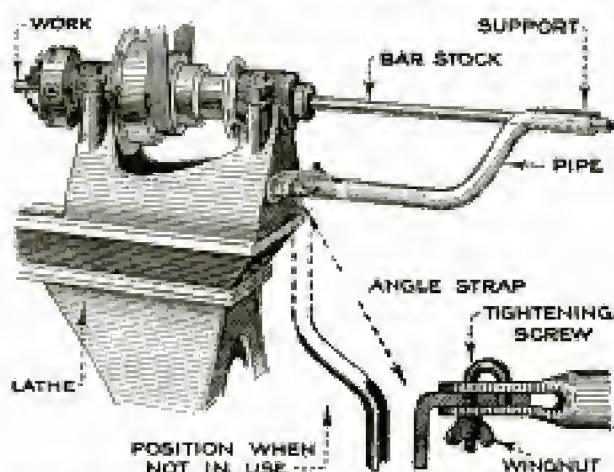
One of the handiest sets of V-blocks for use on the drill press or milling machine can be made with a minimum of machine work, from standard pipe fittings. These blocks are adjustable for height, which makes them particularly serviceable when the work is to be supported at points having different diameters.



The base of each block is made from a pipe flange, which needs no machining whatever. The standard is a short nipple screwed tightly into the flange. The "V" proper is made from a threaded sleeve or coupling, having a knurled outer surface. The 90° "V" can be cut out with a saw and finished by filing.

Supporting Long Bars in a Speed Lathe

Speed lathes are not, as a rule, equipped with any means for supporting long bars, and, as it is impossible to run these at any



A Support for the Speed Lathe Makes It Possible to Work from the Bar without Cutting the Stock into Short Lengths

speed without support of some kind, the general practice is to cut the long stock into short lengths. In this manner a pile of short ends, which have no more than junk value, soon accumulates. This type of lathe is not always used for bar work, so the support illustrated has the advantage of being readily dropped out of the way, yet remaining a part of the machine.

A piece of iron, bent to form a right-angled bracket, is bolted to the end of the machine, and a piece of pipe is slotted at one end to fit over the bracket. The pipe is then bent at a convenient distance, and the top bend is ground or cut away to allow the bars to pass through. The two parts of the support are connected by a U-bolt, as shown, the long end of which is threaded for a wingnut, so that the device can be swung up into position or released in a few seconds, the only necessary operation being the tightening or releasing of the hook-bolt.

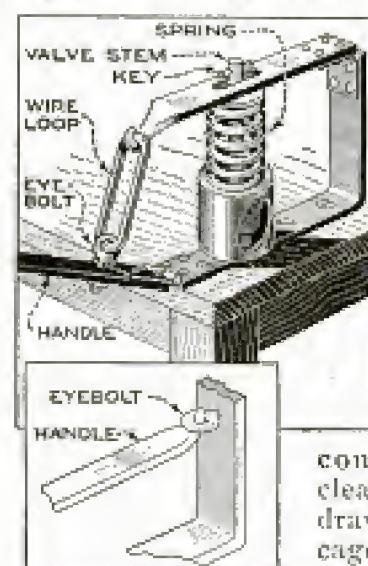
Finding Unusual Armature Trouble

The armature of an automobile generator had been rewound, and it tested perfectly until assembled in the frame; then it refused to develop full voltage, and, when run as a motor, it turned with a strong torque even when the field coils were disconnected. Ordinarily this would immediately suggest a wrong brush position, but the brushes on this machine were fixed and nonadjustable. The only remaining possibility was that the armature-coil ends were all brought the wrong

distance around the commutator before being connected. Before this accusation could be brought against the armature winder, who had otherwise done a good job, it was necessary to prove the fact by a test. The test used was simply to touch two brushes to the commutator, the proper angular distance apart, and find with a compass the axis on which the armature iron was magnetized. If the armature had been properly wound, the armature poles should have come out about midway between the field poles; as they came out far from this position, it proved that the leads were all connected to the wrong bars.

Compressor for Cage-Valve Springs

Usually it is a difficult and slow job to compress the springs and remove the keys in the cage-type valves used on a



number of automobiles, but the easily made device illustrated makes it possible to do this very quickly. The compressor is made of $\frac{1}{4}$ -in. flat-iron stock, and is bolted to the workbench, its construction being clearly shown in the drawing. The valve cages are placed as shown, and the handle pushed downward, the valve stem and key extending through a slot cut in the top member. With this rig, the keys can be removed and replaced almost as fast as the cages can be placed in position.

In the insert a type of construction is shown in which the handle has a hooked end that is placed in eyebolts spaced at intervals along the upright member; this device will take valves of any size. However, a simpler method would be to bore $\frac{3}{8}$ -in. holes in the upright through which the hook could be inserted. This construction may also be used in place of the lower hinge, which requires more work in assembling than the eyebolt method, although it possesses the advantage of having all parts connected, so that no individual parts can be lost or mislaid—a decided advantage in most shops.—D. C. Stephenson, Augusta, Kan.

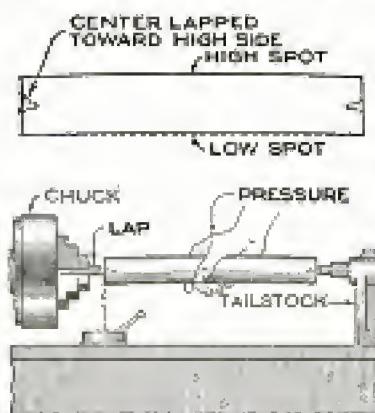
Using Old Blueprint Paper

Having some blueprint paper that had become "stale" in the roll, that is, darkened without having been exposed to the light, and receiving a small order for prints that amounted to less than the cost of a new roll, I decided to make an attempt to use the old paper on hand. The print was exposed in bright sunlight, but, instead of using cold water, the exposed print was washed in hot water, the result being a perfectly legible blueprint. —Edwin J. Bachman, Fullerton, Pa.

Lapping Wristpin Centers

After a large number of air-compressor wristpins had been made up and hardened in the usual way, it was discovered that the steel used was different from that customarily used for this work. The

heat-treating process had caused the work to warp so badly that most of the pins would not clean up in the finish-grinding operation, and to save the pieces the centers were lapped with a

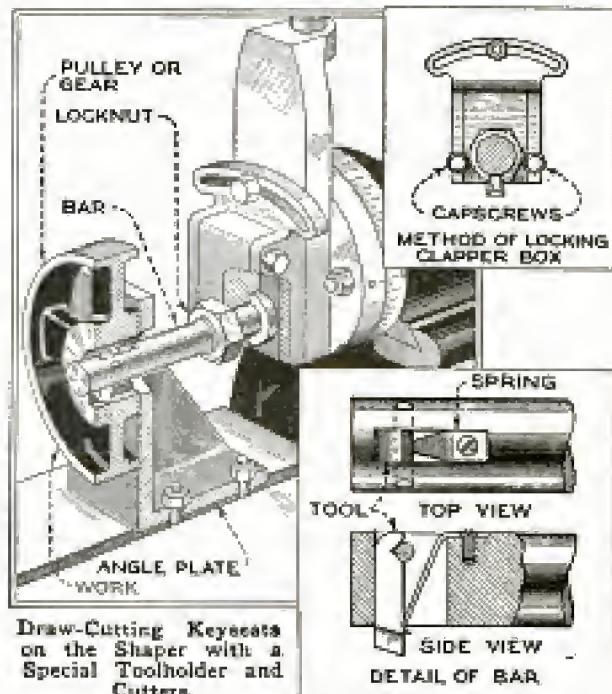


copper lap which was charged with emery. The high spot in the center of the pin was marked with chalk and pressure exerted in an opposite direction when the piece was placed on a speed lathe in the manner illustrated. The lap was first turned up to a 60° angle and then smeared with medium emery and oil. When, after continued lapping, the lap had worn out of shape it was again brought to shape by using a file and center gauge. The amount the centers were lapped depended upon the amount of warp, most of the pins cleaning up with a lapping of .01 in. off center.

Keyseating Fixture for Use on the Shaper Head

Keyseating operations in small shops are usually assigned to the shaper, but to do the work in this manner is objectionable because of the chattering of the gooseneck tool and the breaking away of the front edge of the keyseat. All these and other difficulties can be overcome and

heavier cuts taken by the use of the cutter bar shown in the drawing. The bar is fastened to the clapper box in place of the regular toolholder, and a locknut is provided to hold the bar in the proper position. The tool bit is held in the slot



Draw-Cutting Keyseats on the Shaper with a Special Toolholder and Cutters

of the bar by a tool-steel pin. The upper end of the tool bit is ground off to a radius that allows it to swing in an arc and lift on the return stroke. A flat spring, fastened to the top of the bar, holds the tool in the cutting position, but allows it to lift on the noncutting stroke of the ram. Although a single tool of this description will not answer for all sizes of work, it is simple to make, and a variety can be kept on hand, or made up as required.

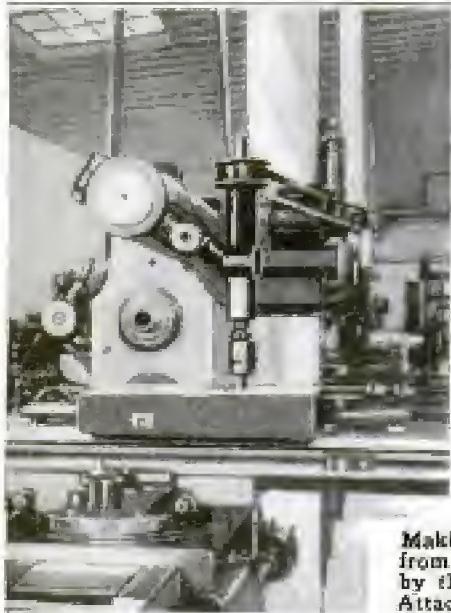
To use a draw-cut tool bar, the clapper box must be tightly held; so holes are drilled and tapped in the outer flanges of the box, and capscrews and washers are used to clamp it and prevent lifting.

The work is mounted on an angle plate in alignment with a hole of sufficient diameter to permit passage of the bar. Greater accuracy and heavier cuts are possible with the draw-cut method, and all causes of chatter and vibration are overcome. Also, the ability to work to the layout line, which is not broken away, is another advantage of such a tool.

In fitting up the cutter for the draw-cut bar, grind it to make a neat sliding fit in the bar slot, and also grind a notch in the tool bit, to allow it to move in an arc without any lost motion on the pin.

Attachment Makes Drilling Machine from Horizontal Miller

Drilling, reaming, and other operations usually done on a drill press, can be done



Making a Drilling Machine from the Horizontal Miller by the Addition of a Simple Attachment; Power is Provided by a Separate Motor

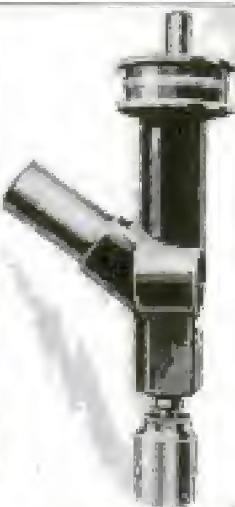
on a milling machine by the use of an attachment similar to the one illustrated. The attachment is a simple casting with an arm cast at an angle to the perpendicular section, the arm being machined to fit into the overarm of the miller. The vertical part of the device is cast hollow and bored for spindle bushings; to the upper end of the spindle a pulley is attached. The power to drive the drill is provided by a separate motor through a quarter-turn belt.—J. H. Rouse, San Francisco, Calif.

Corrosion of Oil Tanks

Investigations carried out on behalf of insurance associations have shown that steel oil tanks, buried in cinders, show greater corrosion than when buried in other materials, probably because of electrolytic action between the steel and carbon in the cinders.

The best coverings, in the order of merit, are: oily sand, sand, gravel, clay, loam, and cinders. It was also shown that ground or tide water do not stimulate corrosion to any great extent. Steel tanks, buried under favorable conditions, should last more than 30 years. In damp ground this time will be reduced to between 15 and 20 years.

Tanks should be coated with red lead and asphalt and buried 3 ft. or more below the surface; ground and tide water should be avoided as far as possible.



Emergency Repair for Stripped Thread on an Auto Axle

A trouble that is frequently met with in rear-axle shafts of some types of automobiles, is the stripping of the threaded end and consequent failure of the nut, which holds the wheel in place, to grip on the axle. An emergency repair that will hold until a new shaft can be obtained, is effected by drilling a $1\frac{1}{4}$ -in. hole about 1 in. deep into the center of the axle, parallel with its axis. A tapered punch is driven into the drilled hole to expand the stripped end. It is only necessary to expand the end of the shaft a small fraction of an inch, after which a new thread can be cut. For the purpose of recutting the thread, in the absence of a regular die, the castellated nut can be run up on the axle in an inverted position. The nut, in most cases, is casehardened, and a serviceable thread will result, especially if portions of the original thread remain as a guide for the improvised threading die.

Locking a Fan-Pulley Pin

An expedient by which the fan pulley of a standard light automobile can be securely locked on the crankshaft, is indicated in the drawing. The pin, as commonly used, frequently works loose and drops out; this is prevented by splitting the outer end of the pin with a hacksaw. The ends are bent apart and the pin is driven into the hole. After the end of the pin has passed the rim of the fan pulley, the ends expand in such a manner that they must be compressed with a pair of pliers before the pin can be removed.



Dressing and Cleaning Leather Belts

In service, a belt gradually loses a portion of its lubricating material, so that unless this is renewed at suitable intervals, the durability of the belt is impaired. A good grease or dressing gives the belt sufficient flexibility, and at the same time causes it to cling to the pulley, but does

not subsequently stiffen or injure it in any way. Among the best belt dressings are mixtures of cod and neat's-foot oils, with tallow, and wool grease free from mineral acid.

Clean the belt well, especially on the pulley side, by washing it with warm water and a good neutral soap, such as castile or white toilet soap, and, if necessary, scrape it on the pulley side to remove any dressing and dirt that may be caked there. Caking of dressings is injurious to the belt and also causes it to run unevenly. Wash rapidly and under no circumstances permit the belt to become wet, as it will then stretch and slip, and cemented joints may become loosened. Apply the dressing, which may be either liquid or solid at ordinary temperature, to the outside of the belt, while it

is at rest, and allow it to soak overnight. It should be applied very evenly and rubbed in with cotton waste, felt, or similar material. If absolutely necessary, a very light dressing may be applied to the pulley side of the belt, using cotton waste or felt lightly coated with the dressing. Even distribution and penetration should be aimed at. Resin, or greases containing it, weaken the belt and shorten its period of service. The use of too much dressing causes undue stretching and loss of grip. Belts should never feel greasy or look greasier than when they were installed. Because a little belt dressing is good for belts, it does not follow that more is better; just as little as possible should be used, but enough to make the belt flexible, and cause it to cling to the pulleys.

How to Make a Motorcycle Trailer

By J. R. KOONTZ

THE painter, carpenter, paperhanger, mason, or other tradesman doing a jobbing business, or the farmer, will find a trailer for a sidecar motorcycle a practical addition to his equipment.

The trailer shown in the illustrations is mounted on a pair of wheels taken from an old hayrake, and runs on a

ladders, lumber, or other long articles. The sideboards are fastened to the bed with bolts, in the same manner as on an ordinary farm wagon. When finished, the box is balanced on the axle so that the weight will be uniformly distributed. The axle may be bolted to the center of the box by drilling holes



An Easily Made Trailer for Attachment to a Motorcycle and Sidecar: The Pictures at the Center and Left Show the Use of Such an Outfit for Hauling Painting Equipment. Right: The Same Equipment Used for Hauling Supplies to the Farm

pipe axle, although one of solid steel could be used. The axle should be long enough so that the wheels will track with a regular wagon, 56 in. center to center, or with the motorcycle and sidecar. The box bed of the trailer is 4½ ft. long by 3 ft. wide, and 8 or 10 in. deep. Make it with loose end gates so that they can be removed in case it is necessary to haul

through the metal and wood, or fastened, as in the drawing, by using brackets or straps, forged from flat iron, and collars to prevent sideplay; all should be provided with setscrews.

The trailer hitch is made either of angle iron or wood; the latter will perhaps be the easier to get, and for this purpose, a piece of 2 by 4-in. hardwood will

answer; it must be long enough to reach from the axle and project about 30 in. beyond the front of the box. An iron

an angle to the right-hand side of the bed. This arrangement makes the hitch solid, helps to equalize the draft, and distributes the pull without undue strain on the motorcycle or sidecar. The hitch must be placed on the left-hand side of the trailer, so that the latter will track with the motorcycle and sidecar, and should be attached to the sidecar frame as closely as possible to the main frame of the motorcycle, so that the pull will be nearly behind the latter; otherwise too great a strain would be placed on the frame of the sidecar.

If something of neater appearance is desired, two old motorcycle wheels, mounted on suitable axle spindles, can be used instead of the iron wheels; this will reduce the noise and allow the trailer to run much more smoothly.

In the winter months, when the ground is covered with snow or ice, the wheels can be removed from the trailer and a pair of runners substituted.

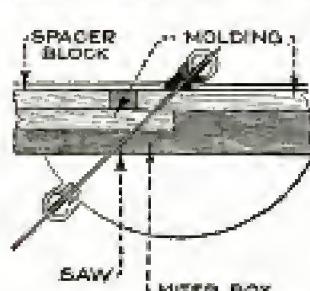
Detail Drawings, Showing the Simplicity of Construction of the Motorcycle Trailer: Such a Trailer can be Easily Built in the Farm Shop

brace is also required, and this should be bent so that it will meet the hitch about 20 in. from the end, and extend back at

the end of the trailer. The trailer may be built in the same way as the one shown in the drawings, except that the hitch should be made of a single piece of iron, and the sidecar frame should be made of a single piece of iron.

Making Invisible Molding Joints

Amateur craftsmen who have had occasion to use odd pieces of molding know some of the difficulties of making good joints. The method illustrated makes a joint that is practically invisible, and is very easily followed. The pieces to be cut are both placed in the miter box and the ends that



are to be fitted together have their angles formed by a single cut of the saw; as both pieces are cut exactly alike, a perfect joint will result. A spacer block, of the same thickness as the molding, is necessary to fill up the space between the side of the miter box and the second piece of molding.—L. H. Georger, Buffalo, N. Y.

Simplifying a Difficult Soldering Job

When soldering the joints on the brine tank of a small refrigerating machine, trouble was experienced in making the solder take hold on the galvanized sheet iron used in the construction. After a number of futile attempts with different fluxes, each resulting in a gaping, leaking seam, the method illustrated was used with success.



The sheet metal was fairly heavy, so some No. 18 copper wire was skinned of its insulation, brightened with sandpaper, covered with soldering paste, and laid along the edge of the seam. Undiluted muriatic acid was applied to the adjacent galvanized metal, and, with a hot iron, the solder was wiped on smoothly; it flowed easily over both metals, and a perfect joint was made.

Improved Small Generator Brushes

Where carbon brushes are used, the generators on some makes of automobiles often fail to charge the storage battery as they should, on account of poor contact. To overcome this trouble, drill a hole through the brushes from face to top, and insert a bunch of very fine copper wires that will fill the hole as tightly as possible, then trim them off flush with the face of the brush. This will increase the output considerably. The copper cores should be staggered so that they will bear on the commutator in different places.—O. G. Crooks, Newcastle, Pa.

Caliper Attachment for Scale

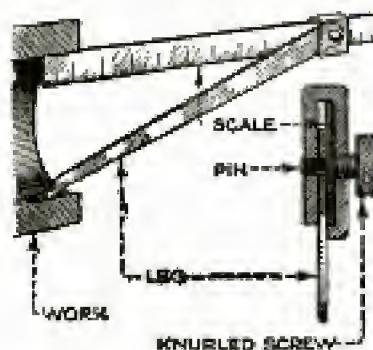
By attaching a caliper leg to a 12-in. scale a tool is obtained that can be used to test whether or not a long hole has been bored straight. Every mechanic knows that a slight taper in a long hole is easily overlooked when calipers are used to measure the diameter, and also,

unless the bore is large enough to admit the hand, it is sometimes impossible to gauge the bottom end of a blind hole at all. A 12-in. power-hacksaw blade, ground

to shape, makes an excellent caliper leg, and can be attached to a scale of the same length in the manner illustrated by the drawing.

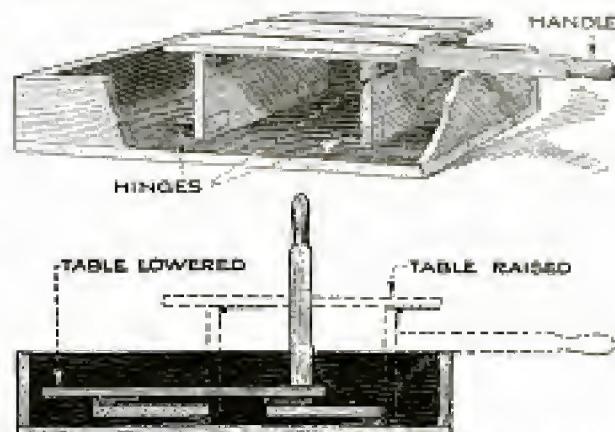
Bend a piece of $\frac{1}{8}$ -in. flat steel, and drill one side for a tight-fitting pin, which projects inside and serves as a pivot for the saw-blade leg. A hole is drilled and tapped on the opposite side for a knurled screw with which the attachment is clamped to the scale.

The caliper is set to the proper dimension by means of another scale, and as the leg is opened the holder is pushed forward to keep the caliper point in line with the end of the scale. In use, the tool is pushed into the bore, with the scale held firmly against one side of the hole. Any variation in size can then be felt immediately as the caliper is moved forward. In addition to being handy for long holes of medium diameter, the tool is also useful for larger holes of short length which must be perfectly straight.



Dipping Tank for Brick and Tile

In the laying of face brick and some forms of ornamental tile, it is necessary that the materials be soaked in water or



other fluid so that the cement will adhere to them. In such cases, the dipping tank illustrated is a most convenient accessory. The tile or brick is placed on a horizontal platform, which is hinged to two parallel supports, the latter being fastened to the bottom of the tank with hinges. A handle is attached to one of the endpieces, for raising or lowering the material into the solution. This enables the worker to do the work rapidly without placing his hands in the bath.

Underground Garbage-Can Receiver

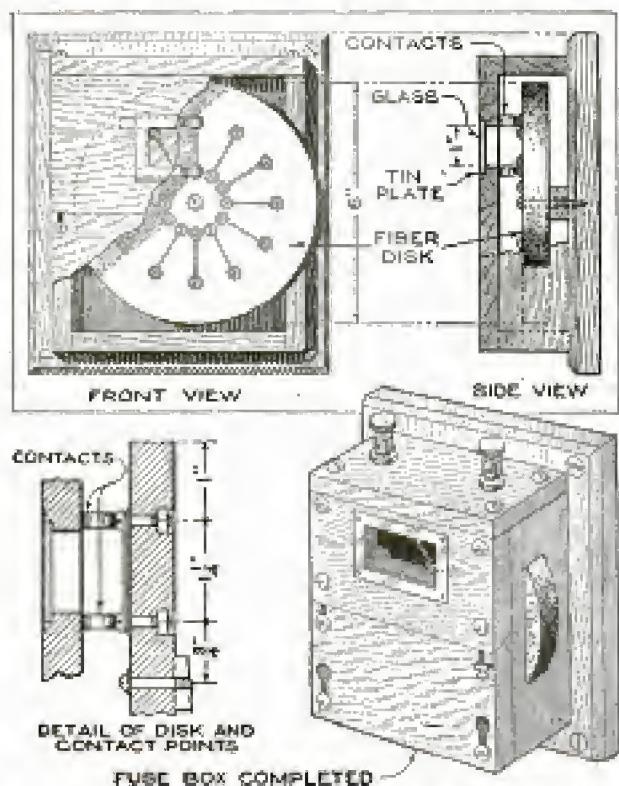
A convenient and inexpensive garbage-can container is easily made from a section of glazed sewer tile, as shown in the drawing. This arrangement conceals the garbage receptacle under the surface of the ground. A section of tile, large enough to receive the can, is set into a pit dug in the ground so that the shoulder end is just flush with the surface.

A mixture of sand and cement is poured into the bottom, to a depth of several inches, so that the container can be easily kept clean. A wooden cover, which fits neatly into the shoulder of the tile, is provided to keep flies and animals from the refuse.



A Multiple Fuse Block

A multiple fuse block is a very handy thing to have in the workshop or experimental laboratory, because, when a



A Fuse Block That Enables a New Fuse to be Put into an Electrical Circuit, to Take the Place of One That has Blown, by the Mere Turn of a Fiber Disk

fuse is blown, a new one can be brought into the circuit by the mere turn of a disk.

Cut out a 6-in. disk from $\frac{1}{2}$ -in. fiber and drill 12 equally spaced holes on a circle 2 in. from the center. Then drill 12 more holes, on a 4-in. circle, in such a manner that the holes in the outer circle will be in a radial line with those on the inner one. Obtain 24 small brass machine screws, $\frac{3}{8}$ in. long, with brass nuts and washers to fit. Counterbore the holes on one side of the disk to a depth of $\frac{1}{4}$ in., with a drill slightly smaller in diameter than the width of the nuts across their corners, and drive the nuts into the counterbores with a flat-ended stick. If the nuts do not fit tightly, small wooden plugs should be driven in around them to hold them in place. Place a washer on each machine screw, and screw them into the nuts from the opposite side of the disk.

Build a case, as shown, a slot being cut in one side so that the edge of the disk will protrude, and mount the disk as indicated. The screw used as a bearing should be fairly large, in order to

present a large wearing surface; a washer should be placed under the screw head and the screw tightened just enough to make the disk turn stiffly. The cover for the case should be made in two pieces. The upper part is permanently fastened to the case, while the lower section is fastened in such a manner that, by slightly loosening the screws, it can be quickly removed. The object of making half of the cover removable is to make possible reloading of the fuses on the disk. A slot is made in the upper part of the case, and recessed so that the small light of glass used will come flush with the surface; a piece of tin or brass, cut to the shape shown, is fastened over the glass with brads to hold the glass in place. Two brass fingers are cut and shaped as in the drawing; these are mounted on the inside of the upper half of the cover, in such a manner that they will coincide and make contact with the two brass screws of one fuse wire. Wires are led from these fingers to binding posts on the top of the case or any other convenient position.

To load the fuse disk, remove the lower cover, loosen the machine screws, and place lengths of standard fuse wire under the screw heads; then tighten the screws. After loading the disk, the cover is replaced, and the disk is turned by its protruding edge until a fuse wire appears immediately behind the glass window. The fuse that appears through the window is the one in the circuit, and if it blows out, it is a simple matter to turn the disk until another fuse is in place.—I. B. Jackson, Lafayette, Ind.

Bottle Cap Prevents Bolt from Turning

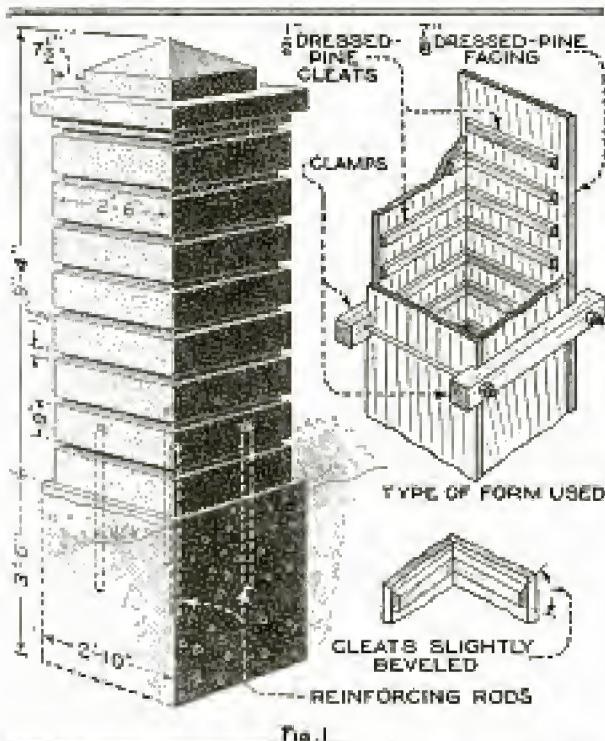
While a man was repairing some of the body irons of a wagon, he found that the holes had become enlarged so that it was hardly possible to prevent the bolts from turning while tightening the nuts. In order to prevent this, the simple method illustrated was successfully used. Square holes were punched through the centers of crown bottle caps; the bolts were driven through the punched holes and the nuts tightened, drawing the corrugated edges of the caps into the wood, and thus anchoring the heads of the bolts securely.



Forms for Concrete Gateposts

The drawings illustrate two designs of concrete gateposts that can be made from easily constructed forms; the latter are put together on the job, and may be used repeatedly.

The style illustrated in Fig. 1 is about the simplest it is possible to build, but the severity of a plain post is relieved by the grooves, which are formed by cleats nailed to the four faces of the form. For either of these types, a footing is sunk $3\frac{1}{2}$ ft. below grade, using alternate layers of field stone and concrete, mixed in the proportion of 1 part cement, 2 parts sand, and 4 parts crushed stone or gravel. Very heavy iron rods are imbedded in the footing with their ends projecting above the ground to serve as an anchorage for the posts. The face forms are made of $\frac{7}{8}$ -in. pine or spruce, and are crossed at intervals by $\frac{1}{2}$ -in. cleats of dressed pine. The front and back faces of the forms should lap the sides, and, when finished, the inside surfaces of all four pieces should be painted with dropblack, which, when dry, is coated with shellac. When set up, the forms should be held together by bolt

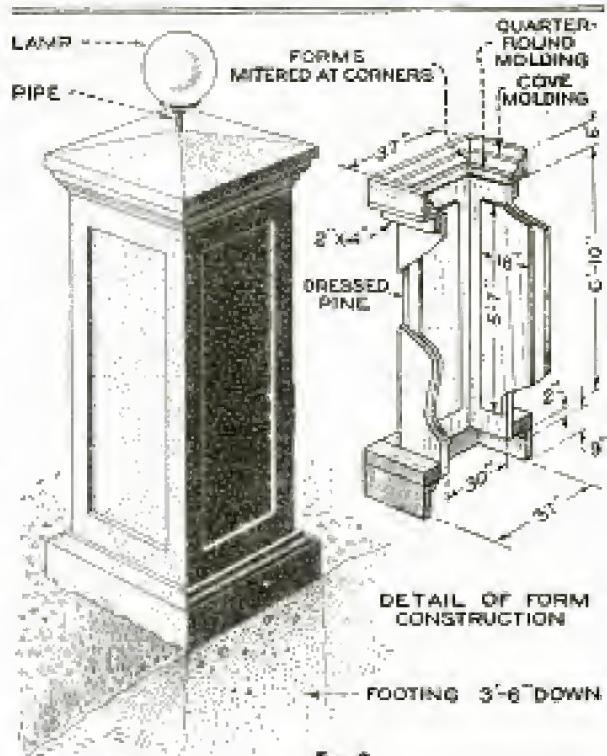


Simples Type of Gatepost and Form: Note the Reinforcing Rods Extending into the Footing

clamps, spaced vertically at intervals of about 2 ft. The pyramidal tops of the posts are trowel-finished.

In general, the construction of the type illustrated in Fig. 2 is the same as the

other except that it is paneled. If a light is desired, center the pipe or conduit, and allow plenty of the thread to project above the form, for attaching the lighting fixture, before the concrete mixture is poured. In all cases, the forms should be plumb, securely braced, and tight, so that no cement will run out with



Form Construction for Panelled Type of Gatepost: The Pipe or Conduit for a Lamp may be Cast in Place and the Top Flashed with the Trowel

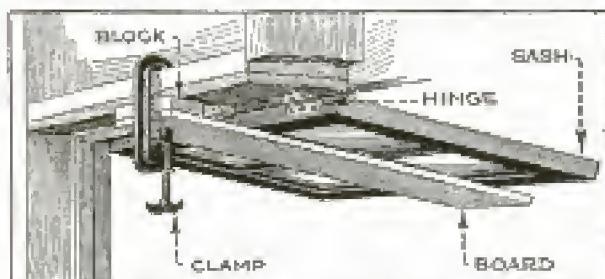
the water and leave unsightly voids on the outside surfaces.

The cement mixture used for both posts should consist of about 1 part cement, 2 parts sand, and 3 parts of fine aggregate, either in the form of crushed stone or gravel. By using white cement, white sand, and white stone or gravel, a practically pure-white effect is obtained instead of the usually objectionable tone of gray or brown. The concrete should be poured into the forms a little at a time, and should be thoroughly rammed so that it will come into contact with all parts of the mold and fill all corners completely. For convenience in removing the forms, the edges of the cleats and panels should be beveled slightly. The bevel shown on the cleats in Fig. 1 is exaggerated so as to illustrate it better.

To fit sheet metal over rivets, hammer the metal over the rivets with a short piece of iron pipe of a diameter suited to the rivets used.

Hanging Hinged Window Frame from Inside

When a window is to be hung so that it will swing outward, the hinges being



The Difficult Job of Hanging Windows to Swing Outward can be Easily Accomplished Single-Handed by Using the Method Illustrated

on the upper edge of the frame, and the work cannot be reached from the outside by ladder or otherwise, it is a difficult matter to attach the hinges properly. A method of doing this consists in first screwing the hinges to the window sash, after which the position of the holes is carefully transferred onto the upper part of the frame, and holes drilled for the screws. Then take a 1 by 6-in. plank, a little longer than the sash, and clamp this to the upper part of the window opening so that the board projects outward with a slight downward angle. This form of window is often hung in rough construction, or buildings that have not been finished inside, in which case it is an easy matter to get the clamp over the framing. If the inside is finished, the plank can be temporarily nailed in place. Next lift the window sash onto the plank and balance it there, and ease off on the clamp or lower the plank if necessary, until the hinges will lift into place and register with the drilled holes. One man can hang windows of this kind by this method.

Preventing Steel Straightedge from Slipping

A surveyor in the field found that he had been provided with a large drawing board, straightedges, and triangle, but that none of the boards was smooth enough to use a T-square with, even had there been one at hand. It was therefore necessary to use a steel straightedge, but it was found that strips of adhesive tape, applied to the underside, would not provide sufficient friction to prevent the instrument from sliding down the inclined drawing board. It was also discovered, however, that the adhesive tape was the only thing that would stick to the steel, and, in order to obtain

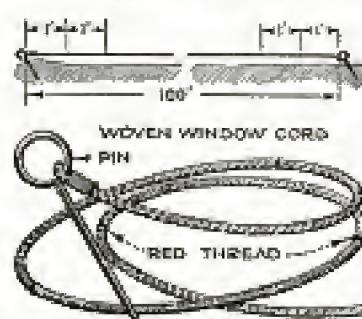
the necessary friction, strips of ordinary table oilcloth were glued to the adhesive tape with liquid glue. Under ordinary conditions glue will not adhere to steel for any length of time, so that it is necessary, in cases of this kind, to apply the adhesive strips first and then glue the oilcloth, with the coated, or smooth, side out, to the tape.—H. E. Balfour, Ottawa, Canada.

Surveyor's Tape Made of Rope

In surveying a piece of land where extreme accuracy is not a requisite, one man can do the job when the tape shown in the drawing is used.

Take a 100-ft. length of window-sash cord, and serve the ends of it around a couple of pins so that the bodies of the pins will be exactly 100 ft. apart. Measure off 10 ft. from one pin and wrap with colored thread, red preferably, as being easiest to see on the ground; continue this for the length of the cord so that it is divided into ten 10-ft. sections. Divide the 10-ft. sections at each end into ten equal sections of 1 ft. each.

To measure distances of less than 100 ft. it is necessary to set the tape on the nearest 10-ft. mark, and measure in feet at the end of the cord, guessing the inches, just as with the steel tape, except



that one sets on a 10-ft. section instead of a 1-ft. division. It is impractical to mark the inches on the cord with anything except ink, which does

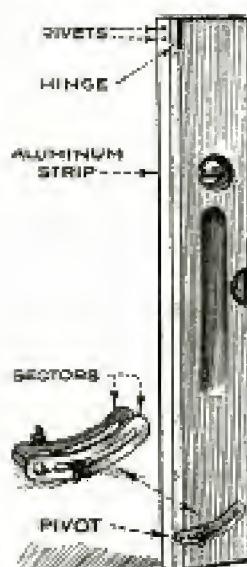
not show well when the tape is wet. In starting the measurement, push the pin into the ground, inclining it a little in the same direction as the measure is to be taken, and carry the other end out 100 ft.; stick in the second pin, inclining it in the same direction as the other and pull the first one loose. If the line to be run is a long one, it is well to set up the range pole at 100 ft. from the instrument, so as to have something to aline with. Reverse the end of the tape and continue until the desired distance is reached, measuring the final distance in the manner described above.

To get exactly on the line, pull the tape across it as nearly at right angles to the traverse as possible, and at sufficient

height to see it with the instrument, placing the middle of one of the 10-ft. sections at one end across where the line should run, as nearly as can be judged with the eye; then go back to the instrument and read the position on the tape at which the stake should be placed.—B. F. Leeper, Chickasaw, Ala.

Level for Tapered Masonry

Anyone acquainted with the operation of laying brick masonry is more or less familiar with the makeshifts used by the masons in fixing up their levels for tapered walls or chimneys. Usually a strip of wood that will



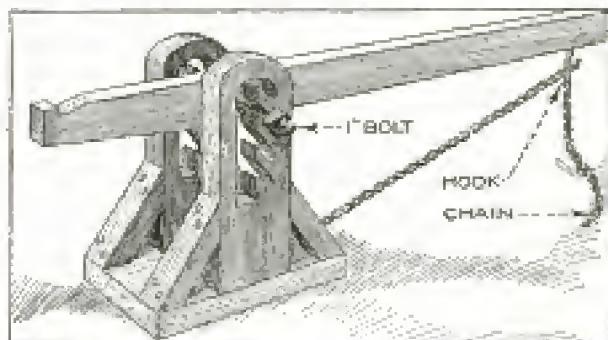
give the proper taper for the work at hand is nailed to the edge of the level, and often there are no facilities in the field for cutting such a strip with any degree of accuracy. The drawing shows a very simple and practical attachment which forms a permanent part of the level, and can be fitted with very little trouble to any standard instrument. A strip of aluminum, or other light metal, is hinged to the upper end of the level, and at the other end is pivoted to a pair of slotted sectors, clamped against the side of the instrument with a thumbscrew. It will be seen at once how easy it is to set the attachment for any taper. There are many reasons why this attachment is a decided improvement, the chief among them being that time is saved; economy is another consideration, as a good level is soon ruined by constant nailing.

A Kink for Draftsmen

Those who have had little experience in detailing machine parts where very irregular curves are a part of their make-up, will find the following hint helpful. Place the article to be drawn on a sheet of paper on a flat surface with a light suspended directly above the center line of the object. A shadow will be cast by the light which can be pointed off easily with a pencil at intervals of about $\frac{1}{4}$ in. This idea is particularly effective when rapid work is required.

A Quick-Acting Jack

The jack shown in the drawing is particularly useful in a garage or service station because of the time saved in jacking

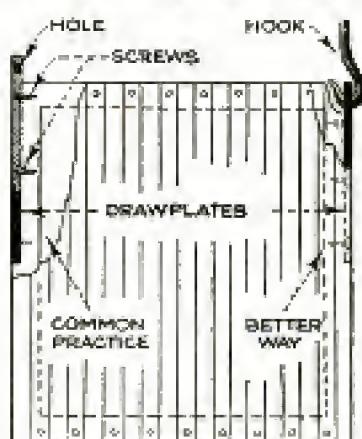


A Jack for Service Station or Garage, Which Makes the Raising of the Front or Rear of a Car a Matter of Seconds

up the front or rear of a car. The details of construction will be apparent at a glance. The long wooden lever is adjustable to different heights by altering the position of its pivot in the notches. A chain and hook are provided for holding the load when raised from the floor.—Theodore E. Landry, Baton Rouge, La.

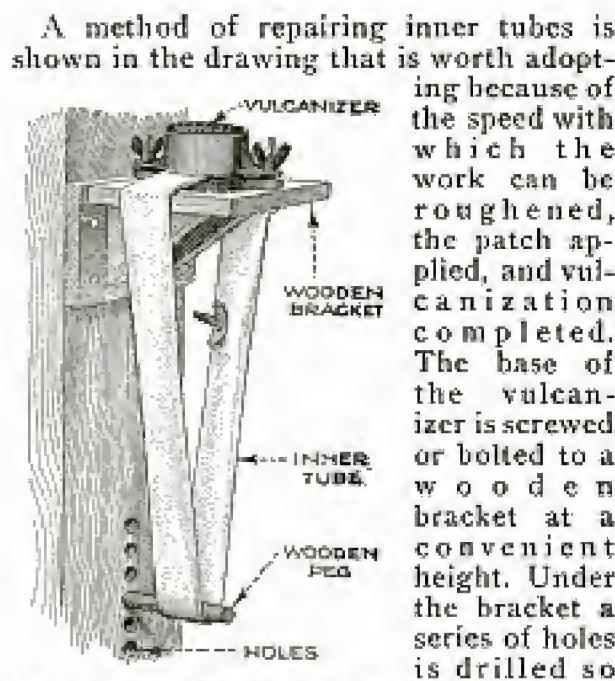
Fastening Drawplates on Patterns

When locating and fastening drawplates on deep-lift patterns, the usual practice is to allow them to extend beyond the flat, or cope, face of the pattern. When rammed up on a bottom board, these extending drawplates prevent the molder from laying the pattern flat on the mold or bottom board; this trouble is often overcome by cutting holes in the bottom board to take the projections, or by removing the plates. A better way of attaching drawplates to the



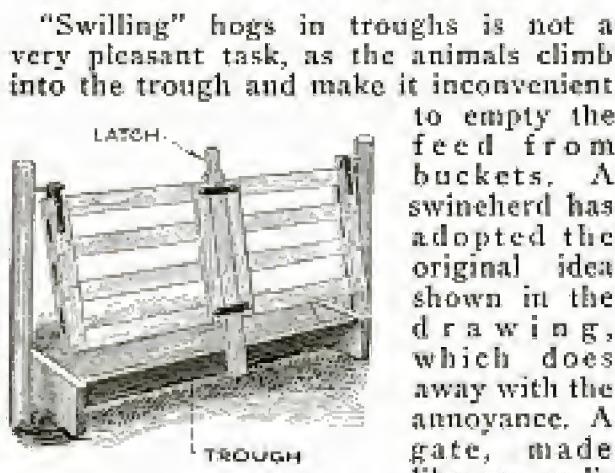
patterns is shown in the drawing, this arrangement making it unnecessary to remove the plates or cut holes in the bottom boards. The end of the plate is brought flush with the cope face, and a recess is gouged out of the pattern just back of the eye, to allow the hooks to be placed in the holes.—M. E. Duggan, Kenosha, Wis.

Vulcanizing Inner Tubes



that any tube can be stretched taut by inserting a wooden peg in one of the holes. With the puncture placed uppermost on the bracket and the tube stretched taut, the roughing of the work and the other operations can be done easily, leaving both hands free.

Improved Swill Trough for Swine

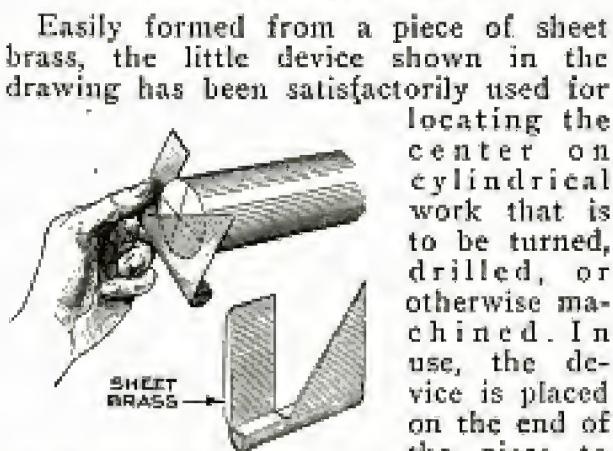


"Swilling" hogs in troughs is not a very pleasant task, as the animals climb into the trough and make it inconvenient to empty the feed from buckets. A swincherd has adopted the original idea shown in the drawing, which does away with the annoyance. A gate, made like an ordinary gate, but fitted with a vertical latch, is suspended between two posts directly above the trough. The hinges, which consist simply of pins and iron straps, are placed at the upper corners so that the gate is free to swing either backward or forward at the bottom. When feeding time comes, the gate is pushed forward and the latch dropped; this holds the gate in place and keeps the hogs from the trough until it has been filled from the other side, when the latch is withdrawn, allowing the gate to swing free.

Asbestos Dams for Babbetting

Clay and putty are the materials commonly used for damming the ends of a bearing which is being babbitted. Finely ground magnesia or asbestos are better, however, as they will not dry out or soften under heat like clay or putty. The material is brought to the proper consistency by mixing it with heavy cylinder oil; it can be used several times.

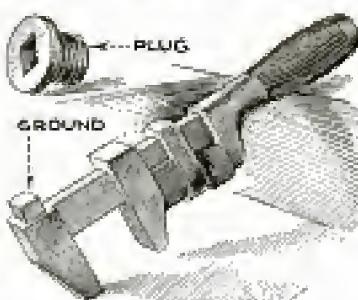
Centering Round Stock



Easily formed from a piece of sheet brass, the little device shown in the drawing has been satisfactorily used for locating the center on cylindrical work that is to be turned, drilled, or otherwise machined. In use, the device is placed on the end of the piece to be centered, the perpendicular part being held closely against the work, and a line is scribed with a sharp point along the 45° edge. Then the device is turned about one-fourth of the way around the work and another line scribed. The intersection of the lines will be the center of the work. However, as a check for accuracy, three or more lines should be scribed across the end.—C. D. Cheney, Lyndhurst, N. J.

Wrench for Plugs

The owner of a farm has a tractor on which removable plugs are used in the axle housing, gas tank, and other parts.



This type of plug has a square hole at the center, into which a squarewrench or key must be inserted. To avoid the delay incident to searching

for the regular wrench, which was usually missing when most needed, an ordinary monkey wrench was adapted for the removal of the plugs, as shown, by grinding down the back of the stationary jaw to fit the square hole.

How to Make a Selenium Cell

BY THOMAS P. BENSON

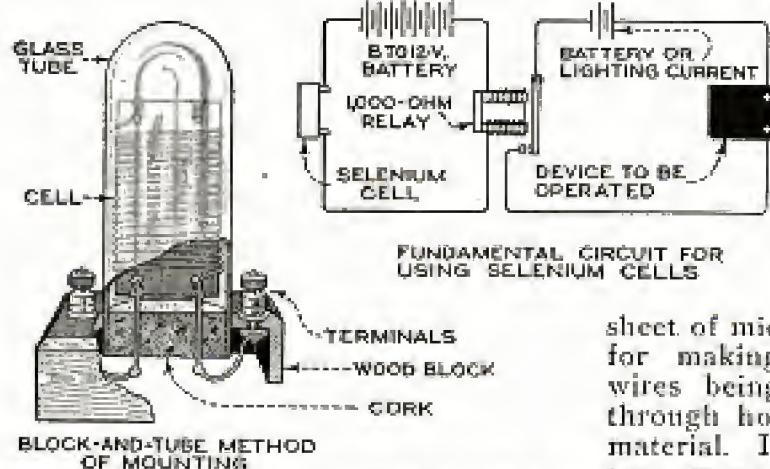
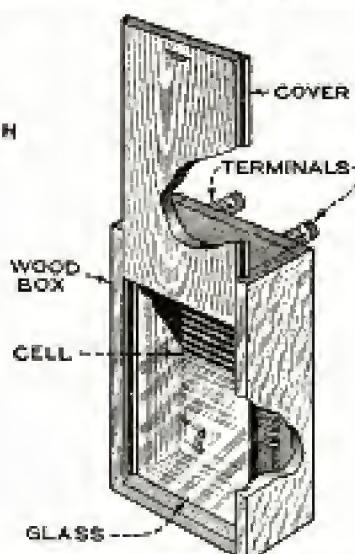
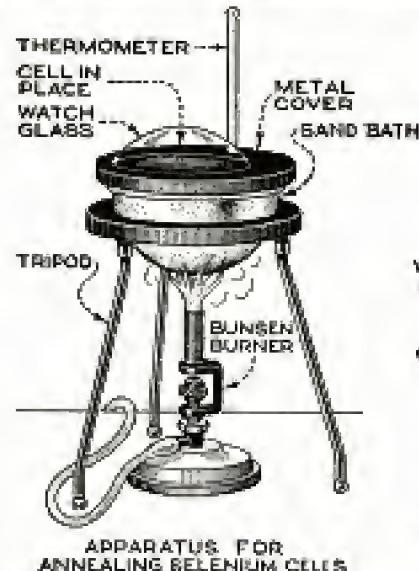
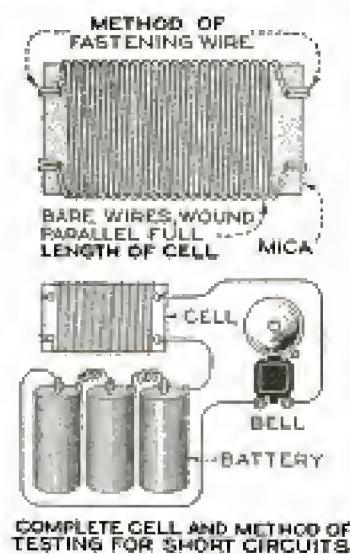
EXISTING demands for a sensitive, reliable selenium cell that can be produced in quantities have not been met in any sense. The development of such a cell opens interesting possibilities to the experimenter and inventor.

There are many types of light-sensitive or photoelectric cells that make use of various substances, such as thallium, barium, or the alkaline metals; the construction of these, however, requires elaborate apparatus, while selenium cells are simple, and comparatively easy to make.

As to selenium itself, it is an element

mere connection of a stick of selenium into a circuit with a relay will not give results, as it must receive special treatment before it will actuate a relay.

A selenium cell consists essentially of two conductors, spaced a short distance apart, with a thin film of selenium forming a bridge between them. The Bildwell type of cell, described in this article and shown in the drawing, is the simplest form for the amateur to make. Two bare wires of copper, brass, or platinum are wound on a heat-resisting form of mica, slate, glass, or porcelain, the wires being



that resembles sulphur in its chemical reactions and occurs in three well-defined forms—amorphous, vitreous, and metallic. Only the metallic form is of value for selenium-cell construction. In this form it is an opaque, black, glossy mass, and a poor conductor of electricity in the dark. It is well to note, at this point, that the

Method of Winding, Coating, Testing, and Mounting Selenium Cells of the Bildwell Type: This Is the Simplest Type to Construct, and will be Found Very Suitable for Experimental Work

spaced $\frac{1}{2}$ in. apart. The size of the wire used is of little importance, No. 26 or 28 being generally used for the purpose. A sheet of mica, 1 by 2 in., can well be used for making an experimental cell, the wires being fastened by looping them through holes punched in the insulating material. It should be kept in mind that two separate wires are used and that neither should come into contact with the other at any point. After the wires have been wound onto the mica, or whatever is used for the insulation, the cell at this stage is tested for short circuits by means of a battery and bell, as in the drawing. If the bell rings, the wires touch at some point and must be separated.

Having proved that no short circuit ex-

Selenium Emerg 18th New York Avenue 3rd Ave
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ists in the winding, the cell is ready for the selenium to be applied. To do this properly, the following apparatus is necessary: a tripod, a Bunsen burner, a sand bath with cover, and a chemical thermometer reading to 225° C. (437° F.). A hole is drilled in the cover of the sand bath to admit the thermometer as in the drawing, which shows the assembly.

The selenium should be bought from a reliable chemical-supply house. Specifying "electrolytic selenium" will insure that chemically pure material is obtained, instead of the commercial grade, which is often sold for cell work, but is entirely unsuited to the purpose. The selenium comes in round sticks, about $\frac{1}{4}$ in. in diameter, and has the appearance of black sealing wax.

To apply the selenium to the cell, the apparatus is set up in the manner shown, and the cell is laid on the metal cover of the sand bath. Light the burner and heat the cell until a stick of the selenium will melt when the cell is touched with it. Then quickly coat the entire surface of the cell with a thin layer of selenium, smoothing out any lumps that may form with a strip of mica. To obtain a satisfactory coating, the temperature must be maintained at about 220° C. (428° F.), when the selenium is in a semifluid condition. At lower temperatures the selenium turns gray and hard and cannot be spread properly without raising the temperature. On the other hand, a temperature in excess of that given will cause the selenium to collect in balls, like mercury.

When a smooth, even surface has been obtained, remove the cell and allow it to cool, turning down the Bunsen burner until the temperature of the sand bath has dropped to about 120° C. (248° F.). The cell is then replaced on the sand bath and allowed to heat slowly. Within a short time the surface of the cell will take on a gray color, which is caused by the crystallization of the selenium. Increase the temperature slowly and watch carefully for the first sign of melting, which is indicated by the selenium turning black around the edges. At the first sign of melting, remove the cell quickly, turn down the burner a trifle, and replace the cell. Continue to watch it for signs of melting; should none appear, it is covered with a watch glass and left alone for three hours. Should the selenium show signs of melting a second time, the cell is again removed, allowed to recrystallize, and replaced on the sand bath after the flame has been turned still lower, the idea being to hold the tem-

perature just below the melting point of the material, for, should it melt during the process, it will be necessary to begin all over again. Care in this annealing operation will prevent a waste of much time.

When the three-hour annealing period is up, the flame is lowered by small degrees over a period of an hour, and then finally turned out entirely. The sand bath and cell are then covered with a heavy cloth and allowed to cool slowly.

When completely cooled, the cell is finished and ready for mounting and testing. Either of the methods of mounting shown in the drawing may be used. The box method is perhaps the simpler and easier; that with the cell inclosed in a glass tube is neater, protects the device from moisture and dust, and makes a better-looking piece of apparatus. To protect the cell from light when it is not in use, a cardboard tube should be slipped over the glass. The cell is now ready to be tested for its light-sensitive properties. It would be well first to connect the cell in circuit with a bell and battery, as already mentioned, and make sure that the wires have not come into contact during the application of the selenium. Should the bell ring, at this stage, the cell is useless and must be discarded.

Selenium cells should only be used with a high-resistance relay. Get a relay, wound to at least 500 ohms' resistance, and three or four flashlight batteries, which will give about 12 volts when connected in series. Connect the cell, batteries, and relay in series, as shown in the diagram, with a separate battery and bell connected to the relay-contact binding posts, to indicate when the relay closes. With the cell covered, or in darkness, adjust the relay so that the flow of current is not quite strong enough to close it. Now allow light to fall on the cell, when the relay should close sharply. Reduce the voltage slightly by cutting out one or more of the batteries, and readjust the relay until it will give quick action with the fewest number of batteries in the circuit. It will be found that selenium cells vary greatly in their resistance, and each one will require individual testing to determine the proper voltage to use.

The action of the selenium cell is more or less understood; in the dark it has a very high resistance and will permit but a small current to flow. On allowing light to fall on it, the resistance drops to from one-half to one-quarter of its "dark" value, and more current flows, thus closing the relay. The higher the resistance

of the relay used, the more satisfactory the results will be; a 1,000-ohm polarized relay is the best for the purpose.

It is not within the scope of this article to describe in detail the application of selenium cells. They may be used for any purpose where light is desired to be the controlling agent. Thus, they can be used as a sunrise alarm, the rising sun acting on the cell to control any desired apparatus. As a burglar alarm the intruder's flashlight serves to operate the apparatus; garage doors can be arranged to open automatically when the headlights of the car flash on the cell. There are many other applications for selenium cells that are interesting and instructive; for example, a secret lock on a door can

be made so that anyone familiar with the arrangement may open it by striking a match and holding it before the keyhole, thus affecting a cell mounted in line with the aperture and controlling an electric lock. The number of applications is limited only by the constructor's ingenuity, but a few precautions should be observed in the care and use of the cell.

Do not overheat it by passing too strong a current through it, and keep it protected from dust and moisture. When not in use, the selenium cell should be kept in the dark, because long exposure to light fatigues it, and it loses its sensitivity temporarily. A daily exposure to light for a short period, however, seems to mature and improve it.

Electroplating Stainless Steel

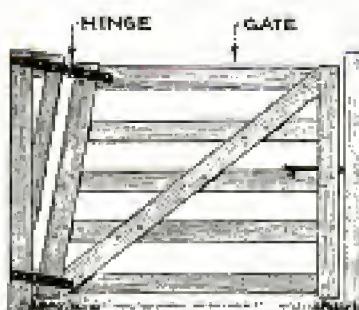
It has been found that stainless steel is unaffected by many plating solutions that are successful when used with ordinary steels. Even the usual copper solution with which steel is coated as a preparation for other deposits, fails to make a successful job of plating the new metal. Direct nickelplating also fails with stainless steel. The most satisfactory coating for this metal has been found to be zinc deposited from a cyanide-of-zinc solution.

A Self-Closing Gate

Instead of the cumbersome chain and weight generally used to keep gates to the garden and poultry inclosure shut, the arrangement shown in the drawing may be used. It is neat in construction, and will always swing the gate shut when released. In making a gate of this type, the width of the top should be made about 6 in. less than the bottom, and either the post to which it is fastened

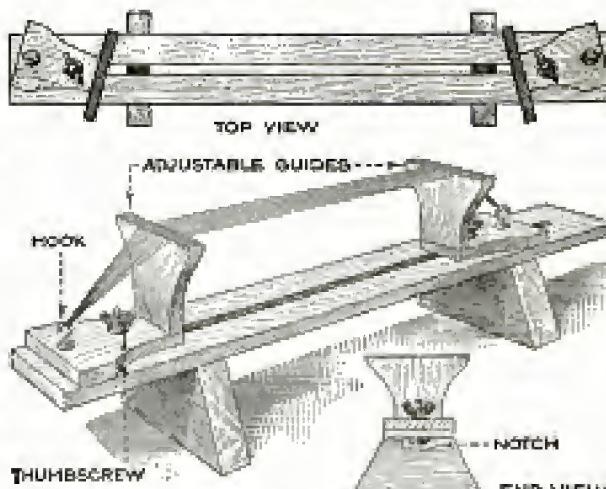
should be inclined at the same angle or an extra piece nailed to the post, parallel with the side of the gate. When the gate is hinged as shown, it will swing upward

at the outer corner so that, when released, it will instantly shut. The hinges should always be put on at right angles to the sloping pieces.—H. F. Grinstead, Columbia, Mo.



An Improved Loom for Beadwork

Devotees to woven beadwork will be quick to appreciate the advantages provided by the adjustable loom illustrated.



A Bead Loom with Adjustable Guides for the Advanced Worker: The Guides can be Moved Independently of Each Other

This loom does not differ in general appearance from the common type, except that the guides are adjustable. There is a slot through the center of the base which extends to within a short distance of each end and serves as a guide for the thumbscrews that clamp the guides to the base. The guides are made separate from the base and can be placed at any distance apart on the base or set at any angle. Two small brass hooks are provided on the guides, as shown, for drawing up the threads. The small notches in the top of the guides are placed $\frac{1}{16}$ in. apart, and every or every other one may be used, according to the kind of work being done.—Oslar B. Walker, Columbus, Ohio.

Spring Clamp for Acetylene Welding

A large part of the jobbing welder's time is spent in the repairing of cast-iron articles of medium or light thickness, the ends and corners of such articles frequently becoming broken off. Before these broken pieces can be welded together, they must, of course, be lined up, and this operation takes more time than the actual welding itself, if the usual method of packing with various odds and ends is followed. A spring clamp that will hold the broken piece in position while it is "tack"-welded, can be made in a few minutes from a piece of steel wire. In the illustration such



a clamp is shown attached to the front of a stove casting, to hold a broken corner in place. The steel wire is not hardened, the natural spring of the metal being sufficient to hold the pieces; also, by leaving the wire soft, the ends that pass underneath and support the broken piece can be bent as desired to conform to the shape of the work. This clamp will hold any broken piece that is not too heavy, provided the top end is pushed over onto the main part of the work. By making the upper part of the clamp as shown, it can be used on work with beaded edges, shoulders, etc. The clamp is not left in place all the time the weld is being made; it is merely used to hold the parts in place for tack-welding at either end, after which it is removed.

Refinishing Brass Beds and Lighting Fixtures

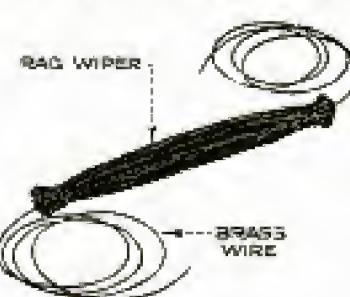
Brass beds and lighting fixtures are given a coat of lacquer in order to protect the polished surface as long as possible, and prevent it from turning black. During the annual housecleaning period all such brass work is usually polished, with the result that the lacquer is rubbed off in spots, leaving unsightly patches that contrast sharply with the lacquered portions. Fixtures in a kitchen will turn black quicker than those elsewhere in the house, as smoke, steam, and grease cause the protecting varnish to fail. In order

to restore their original luster, it is necessary to remove all the old finish; this can be done by rubbing with a rag saturated with alcohol. Should the alcohol fail to remove the lacquer, it is an indication that the latter is made with a turpentine base, in which case turpentine instead of alcohol should be used. Next get a good metal polish, and go over all brass work thoroughly until it has the desired polish. Wipe off every trace of the polish, using clean rags so as not to leave any grease, which would prevent the lacquer from sticking. Then put on a coat of the lacquer and allow it to dry. Lacquer can be bought at most paint stores, but if it is unobtainable, it can be made after the following formula: Dissolve 3 oz. gum mastic in 1 pt. of turpentine by shaking. After dissolving the gum, strain the liquid through a piece of clean cheesecloth. As the density of the mastic varies somewhat, it may be necessary to add a little more than the quantity given; the idea is to make it thick enough to flow easily under a common varnish brush. If a more golden finish is wanted, add $\frac{1}{4}$ dr. of turmeric and also $\frac{1}{4}$ dr. of gamboge. Three coats of the lacquer should be applied, and each should be thoroughly dry before the next is put on. This varnish may be cleaned with a soft sponge and white soap and water.

For gas and electric fixtures in the kitchen there is nothing better than a coating of clear yellow spar varnish, containing Chinese wood-nut oil; such varnish, besides being flexible, will withstand the effects of steam and grease. It will last longer than the lacquer.

Cleaning Auto Oil-Feed Pipe

When the oil-feed pipe of an automobile engine becomes clogged, the usual cleaning method consists in blowing air under pressure through it, or passing a wire into it in an effort to clear the obstruction. In the course of time, however, the oil deposits a film of waxy or



gummy substance in the tube, and the methods described can only be depended upon to remove solid obstructions, leaving much of the

dirt sticking to the inner surface of the pipe. A better one is used by an automo-

bile-service station to clean the oil-feed pipes of its customers' cars thoroughly. A piece of brass wire is looped around the ends of a piece of rag; the wire is passed through the pipe, pulling the rag swab along with it, and as both ends of the wire project from the feed pipe, the swab can be worked back and forth until all foreign matter is removed.

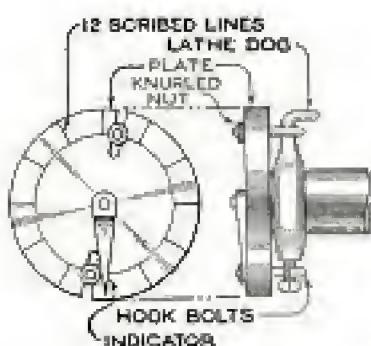
Indicator for Shaper or Drill Press

Very often the lack of a simple indicating device has caused hours of extra work on a shaper or drill press, when shafts, or other round work, are being splined, key-seated, or otherwise machined. The indicating plate illustrated can be attached to the end of stock of any diameter that

has a center hole, and will be found very convenient for accurately dividing it. The plate is 8 in. in diameter and $\frac{3}{8}$ in. thick, with a $\frac{5}{8}$ -in. reamed hole in the center. Twelve

equally spaced radial lines are scribed on one side, and two slots are cut at opposite points on the circumference, as shown; hook bolts, fitted with knurled nuts, are used in these slots. Fitting snugly in the reamed hole in the center is a pin having one end pointed to fit the center in the work, and the other end tapered. An indicating piece is made from flat stock, one end being drilled to fit the tapered pin easily, and the other end pointed. To hold the plate in position, a lathe dog is tightened on the shaft, then the plate is held against the end of the work with the pin in the center hole. The hook bolts are placed over the dog, the knurled nuts tightened lightly, and the plate is swung around until the pointer coincides with one of the lines, when the nuts are drawn tight. If it is desired to work on the shaft at, say, six different positions, the shaft is loosened in the vise or V-blocks, and revolved until the pointer, which hangs in a vertical position, coincides in turn with every other line on the plate.

Oxygen and acetylene tanks should never be handled by crane, either magnetic or mechanical.



Dragging Bowlders with a Tractor

When moving large rocks from a field, attention should be paid to the manner in which the hitch is made. The chain



Pulling Heavy Bowlders with a Tractor, Illustrating How the Hitch should be Made in Order to Enable the Tractor to Pull the Load Easily

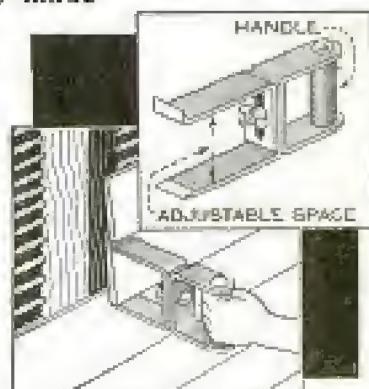
or cable used should be fastened to the load as close to the ground as possible. Thus, when power is applied, the pull will be away from the ground rather than along it, or—worse—against it. In the illustration, the hitch is made in the proper manner, but the pull might be made even lighter by attaching the tractor end of the chain a little higher. Another important factor is the length of the chain. If possible, not more than 3 or 4 ft. of it should extend between the tractor and the rock. The closer the two are, the greater will be the angle of pull, and the less the draft necessary.

A Handy Siding Gauge

A gauge that will save a great deal of time in the application of siding to a building can be made

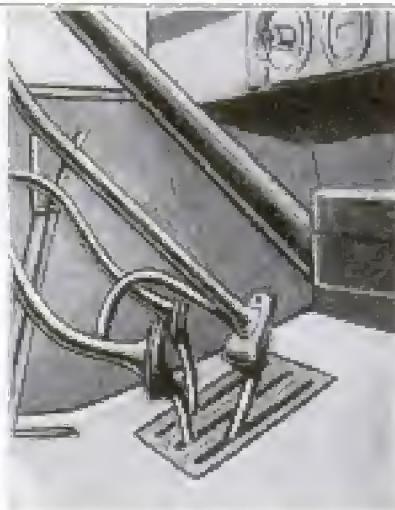
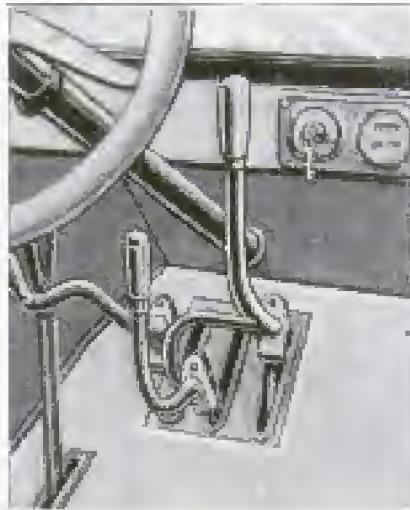
from three pieces of flat iron. It consists of three pieces of iron, with a rivet bolt and wing nut. The iron pieces are formed and the tool assembled as in the drawing.

With one end of the siding temporarily tacked to the studding or sheathing, the other end is accurately spaced by means of the gauge, applied as illustrated, and the nail driven home. Before the last blow is struck, the gauge may be slid along to the next point to be nailed.



Automobile-Control Pedals Operated by Hand

The controls of a light automobile, fitted for the use of a man who had lost both legs, are shown in the illustrations. Three le-



Extensions to Pedal Controls of an Auto That Enable a Cripple to Drive His Car. Left: General View of the Pedal Extensions. Center and Right: Method of Connecting the Brake and Clutch Levers So That the Clutch is thrown into Neutral by a Forward Movement of the Brake Handle

vers are welded to the pedal pads of the clutch, reverse and brake pedals,

the levers being of such length that they are within easy reach of the driver. A fourth rod is welded at right angles to the brake pedal, and carried over to the clutch in such a manner that the clutch will be forced into neutral when the brake lever is pushed forward. Thus, the brake is applied and the gears disengaged with a single movement. The tops of the handles are fitted with leather grips such

as used on the handlebars of a bicycle.—
G. K. Bowman, Columbus, Ohio.

Testing Penetration of Wood Preservatives

The effectiveness of any wood-preservation treatment is measured very largely by the depth to which the preservative penetrates. The presence of creosote oil is indicated by the dark discoloration, and the degree of penetration may be readily found by taking a sample at a point free from checks and other imperfections and at a considerable distance from the end. This may be done with an ordinary $\frac{1}{2}$ -in. bit, or with an increment borer, which brings out a core of wood showing in cross section the depth of penetration. The observation should be made at once, because the oil spreads rapidly over the cut surface. In order to prevent infection, the hole in the treated piece should be tightly closed with a creosoted plug.

Zinc chloride, on the other hand, is colorless, and the depth of penetration of this preservative must be found by chemical means. After cutting the stick in two, or obtaining a sample by means of the increment borer, the freshly cut surface is dipped for not over 10 seconds in

a 1-per-cent solution of potassium ferrocyanide, and the excess solution is removed by blotting paper. The sample is then dipped in a 1-per-cent solution of uranium acetate and dried. The treated portions will be whiter than the natural wood, and those untreated will have a dark-red or maroon color. This method does not give very sharp contrast on wood which is reddish in color, like red oak, but is otherwise very satisfactory.

Another method consists in spraying over the freshly cut surface a mixture of equal parts of a 1-per-cent potassium-ferrocyanide solution, a 1-per-cent potassium-iodide solution, and a 5-per-cent solution of soluble starch. This mixture colors the treated portion a very dark blue but does not affect the untreated wood. Although the color fades in time, it may be brought back by spraying again.

Sodium fluoride is also a colorless preservative, but no satisfactory method for showing its presence in wood has been devised. Mercuric chloride, which is another colorless preservative, turns black when dipped in a solution of hydrogen sulphide.

Amateur Mechanics

Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

Motor Wheel Serves as Home-Shop Power Plant

By L. B. ROBBINS

A POWER PLANT that will operate small drills, grinding wheels, lathes, and similar machines, in the home workshop, can be readily made from one of the popular motor wheels, in the manner shown in the illustrations. When the bicycle is laid up for the winter, the wheel can be taken off and used in the shop.

First, choose the location best suited for the installation; this should be an overhead beam or joist running at right angles to the bench. Set the machine to be operated on a bench, so that it will not interfere with other work, and then locate the motor wheel back of the center line of the machine, if possible, so that the belt will run at an angle. The motor wheel is suspended from the ceiling by a flat-iron hanger; this should be long enough so that, when it is fastened to the beam and the motor attached, there will be at least 15 in. between the top of the tank and the ceiling. This arrangement provides room for filling the tank with fuel. One of the hanger legs is a straight piece of iron, while the other is offset so that the bottom ends are 12 in. apart. Drill three holes in the top of the legs and one $\frac{1}{2}$ -in. hole an inch from the bottom of each; the latter is for the pivot bolt. Attach the legs to opposite sides of the overhead beam or joist with bolts or lag-screws, and make sure that the pivot holes are exactly in line with each other. Then drill a smaller hole in the straight leg, 15 or 16 in. above the

pivot hole, and bolt a diagonal iron brace to it and the beam—it may be found necessary to use two such braces, and one between the legs, as shown, to keep them rigid and perpendicular.

Place the end of the motor wheel that attaches to the bicycle between the legs, and pivot it to them with a bolt made



A Motor Wheel, Detached from the Bicycle When the Summer Is Over, and Installed above the Bench, Provides a Small Power Plant for Driving the Tools in the Home Workshop

from a piece of $\frac{3}{4}$ -in. round iron rod, threaded at both ends and provided with nuts and washers. Set a piece of pipe over the bolt to serve as a spacer; this should be long enough to keep the motor wheel bearing against the straight leg.

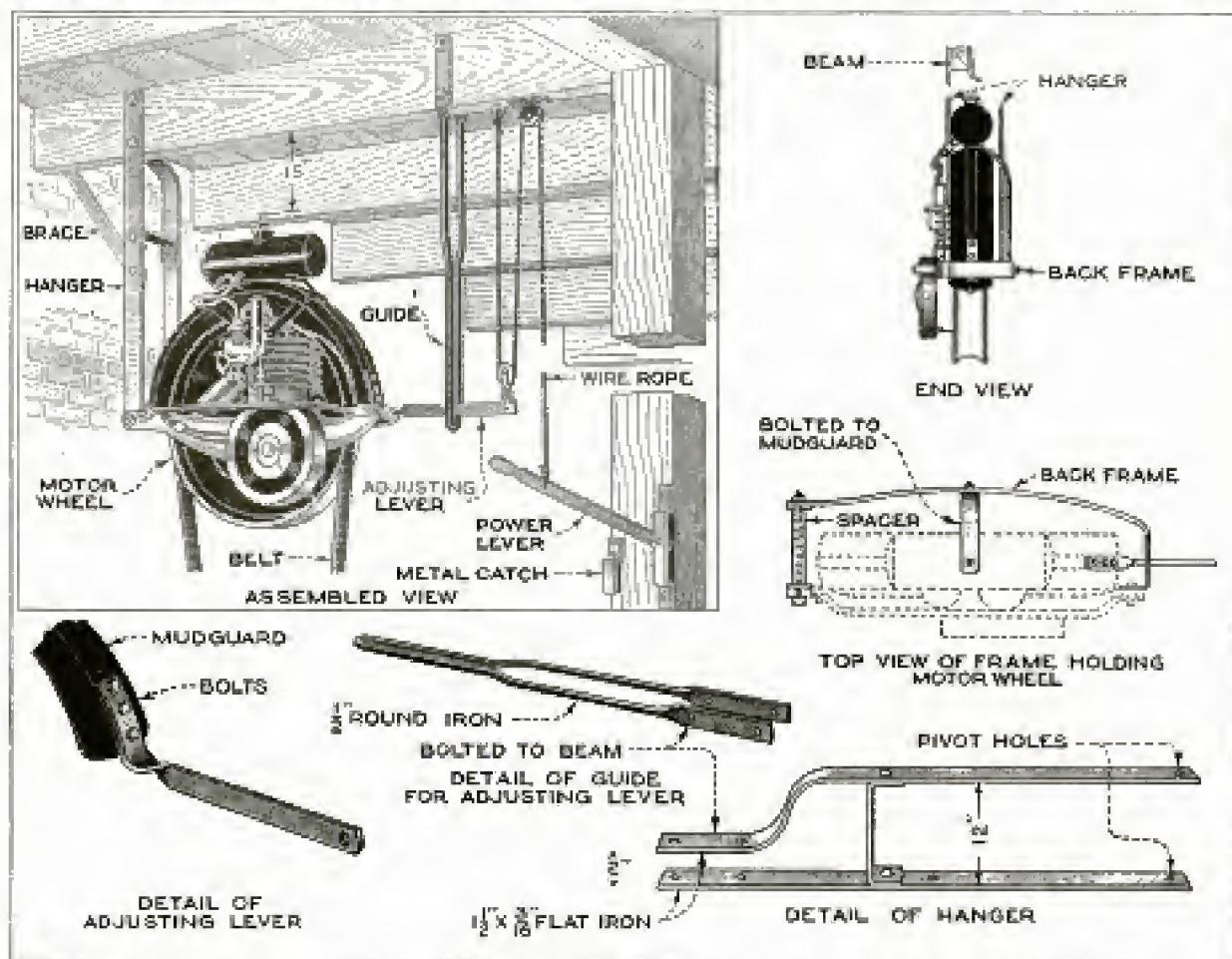
Drill two or three small holes in the rear end of the mudguard and bolt on the

adjusting lever shown in the drawing. This lever is made from a piece of heavy iron, twisted at one end and curved to fit the mudguard. Holes should be drilled in the iron to correspond with those drilled in the guard, in addition to a hole in the end for the pull wire.

Next, a guide is made from a piece of round rod, the ends of this being flattened, and bolted to the beam directly over the adjusting lever. With the motor wheel blocked horizontally, adjust the guide so that the bottom will be about 3 or 4 in. below the adjusting lever. Forge the sides of the guide together, so that they just allow the lever to slide easily between them without undue play.

and under the metal catch shown, the motor will be raised about 3 in. above the bottom of the guide.

Lastly, make a back frame of flat iron. This should be bolted to the bent leg of the hanger at the pivot hole, and to the end of the motor wheel below the adjusting lever. This is done by removing the bolt that binds the engine crankcase to the motor guard, slipping the iron against them, and bolting all three together with a longer bolt. Then bolt a properly bent piece of flat iron onto the middle of this back frame, at right angles to it, and bolt or rivet the end to the mudguard underneath the fuel tank; this forms a rigid frame and keeps the motor wheel vertical



Inset: The Complete Assembly. Upper Right: End and Plan Views of Back Frame and Brace. Lower Left: Detail of Adjusting Lever. Center: Construction of Guide. Lower Right: Assembly of Hanger

Attach a pulley and a screweye to the overhead beam, and a pulley to the end of the adjusting lever. Then fasten a length of small wire rope to the screweye and reeve it through the pulleys as shown. Lead the end of this rope down to a pivoted lever that is fastened to a convenient post, or to the wall, and attach it so that, when the lever is up, the motor wheel will be lowered to the bottom of the guide; when the lever is down

and always in line with the machine below.

Place the control lever in a convenient position and remove the tire from the rim, to leave a pulley large enough for high-speed work. Belt the machine so that the belt is loose when the lever is raised; this allows the motor to run without operating the machine. As soon as the power lever is pulled down and caught under the catch, the belt will be tightened

and the machine will turn. In this way the engine can be kept running while the machine is stopped for any reason.

The engine is started by setting the controls and spinning the rim, and the speed can be regulated to suit the work in hand by means of the spark and throttle controls.

Starting a Saw Cut Smoothly

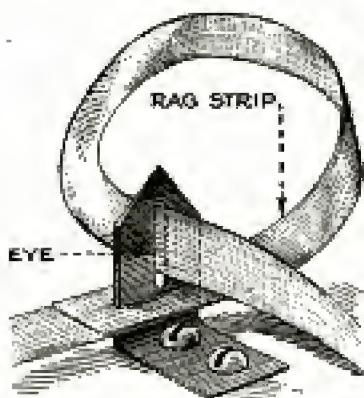
Everyone using a handsaw has, at one time or another, had trouble in getting the cut started in the wood, as the teeth catch in the edge and either stop the saw or mar the edge. A remedy for this is to file smaller teeth on the last two inches of the blade nearest the handle. This may be done by filing the point off the teeth so that a notch can be cut in each of the old teeth, thus making two teeth from each one. A few strokes with these small teeth will start the cut easily. If more convenient, the small teeth can be filed at the outer end of the saw.—Chas. N. Shaw, Jr., Oxford, Ga.

Joining Rag Strips for Weaving

Much of the time and labor required to sew the strips of rags together, which are to be woven into carpet or braided into rugs, can be saved by a simple and easily made device. A small piece of thin, flat steel is bent at right angles, the upper end pointed and sharpened, and a slot or eye cut in it, through which the strips may be inserted. Two holes are also drilled into the horizontal part for attaching to a

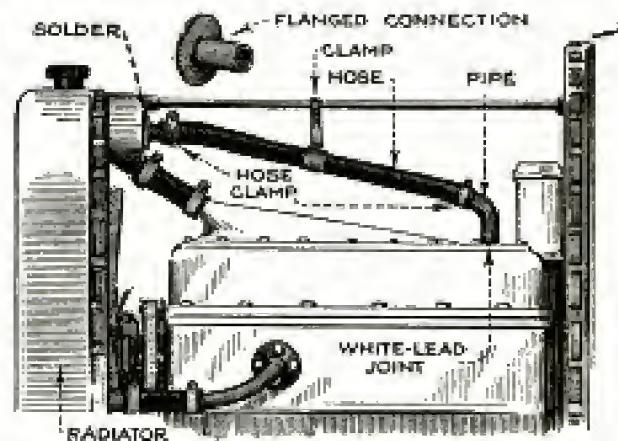
t a b l e o r wooden block. In use, the strip to be joined is laid over the end of the other and both pushed down over the sharpened point; then the loose end of the former piece is

brought through the eye, and pulled up close. When this has been done, the junction of the two strips is pulled up from below, the portion in the eye passing through the slit. After the strip has been pulled out of the eye and drawn up tightly, the resulting joint will be almost perfectly flat.



Auxiliary Piping Prevents Overheating

A means of preventing an automobile engine from overheating can be provided by adding an auxiliary outlet pipe in the

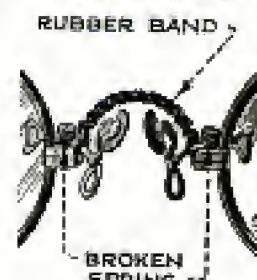


Preventing Overheating of Automobile Engine by Providing an Auxiliary Pipe; Thus the Water from the Rear Cylinders Passes Directly into the Radiator

manner suggested in the drawing. A hole is drilled and tapped near the rear of the cylinder-head casting to take a 1 or $1\frac{1}{4}$ -in. pipe; this is bent as shown, and, after coating the threads with white lead, screwed into the hole. A hole is cut into the back of the upper header on the radiator, and a flanged connection of the type shown is soldered, or, better, brazed to it. The two connections are united by a section of rubber hose, which, if inclined to vibrate too much, can be supported from the radiator stay rod. The extra pipe allows the hot water from the rear cylinders of the engine to pass to the radiator without passing over the forward cylinders.

Repair for Broken Eyeglass Spring

Wearers of pince-nez or "nose glasses" often find that one or both of the small springs on the bridge of the nosepiece are broken, or have become so weak that the glasses slip off. Of course, the proper thing to do is to take the glasses to a jeweler or optician for repair, but, in an emergency, resort can be had to the method illustrated. One end of a small rubber band is slipped over one of the guards and wound around the bridge often enough to obtain the proper tension, when the opposite end is pulled over the guard on the opposite side.—Truman R. Hart, Ashtabula, Ohio.



Match-Box Holder and Lighter

Easily made from a piece of sheet metal, the match-box holder and cigar lighter



A Match-Box Holder and Cigar Lighter That Prevents the Small Boxes of Safety Matches from becoming Crushed in the Pocket, and Provides a Windshield That Makes It Possible to Get a "Light" Even in a High Wind

illustrated makes it possible to carry the small boxes of safety matches in the pocket without crushing, and provides a windshield for the flame so that it is easy to get a "light" even in a strong wind. The sheet-metal strip from which the device is formed is cut to the width of the match box, which is about $2\frac{1}{4}$ in. long. A slot is cut in the middle of the pattern, through which the match to be struck is inserted. Also, an ear, about $\frac{1}{8}$ in. long, is provided on what is to be the bottom. After the sheet-metal form has been cut, it is bent as shown, and the ear is turned up and soldered to the sides. The holder illustrated is embellished with a foreign coin.

A Two-Handled Cord Reel

A reel that will save much time in the winding of kite strings, fishlines, clothes-lines, and other cords, can easily



be made from a piece of board of the proper length. The ends are cut out to hold the cord and to prevent it from slipping off, and handles are fastened on opposite edges of the board, near each end, as illustrated. After attaching the cord to the reel it may be wound up easily and rapidly.

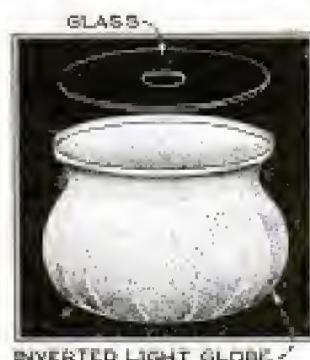
Pulling Light Car Out of Mud

An owner of a light automobile has used a novel idea for extricating his car from bad mudholes. He raises the engine hood and passes one end of an ordinary clothesline through the footboard, tying it to the clutch pedal. The engine is then speeded up, the driver walks to the loose end of the rope, throws it over his shoulder, and pulls. This throws in the clutch and applies power to the rear wheels, which, together with the force of the pull and the lessened weight in the car, suffices to pull the car out in most cases. As soon as the pull on the rope is relaxed, the clutch will throw itself out, and the car stops. The emergency-brake lever should be kept in the neutral position during the operation; this allows the low-speed band to engage, but prevents the pedal

from flying back into high and stalling the engine.

Keeping Insects from Light Bowls

A mercantile concern has a large number of inverted electric-light globes under a balcony that runs around the store. Formerly it was a regular weekly job for the porter to unscrew the globes and re-



move the accumulation of dead insects and other matter that collected in the bowls. Finally, shields of glass, cut circular to fit the open ends of the bowls, and with a hole in the center to slip over the light sockets, were used to cover the openings. This arrangement did not interfere with the illumination and kept out the dust and insects. Having successfully demonstrated its usefulness, the idea was applied to all the lamps in the store.—Chas. A. Goddard, Los Angeles, Calif.

GA small hole drilled through the socket provided in stove lids for the lifter, will allow the light from the fire to shine through so that the location of the socket is easily found in the dark.

Making Varicolored Flash Papers for Stage Effects

Amateur plays are often produced in small communities where there is no electric-lighting current. If the play calls for fire scenes, lightning, artillery fire, explosions, etc., it is difficult to produce much of an effect without electric lights. For just such occasions, a set of varicolored flash papers will produce the effects desired. These papers can be prepared at home at small cost.

It is well, at this point, to call attention to the danger attending the use of these sheets, as well as of colored fires, etc., in close proximity to scenery, costumes, and other "props" that have not been fireproofed. Sheets of tissue paper, about 12 in. square, are used; these are cut in half for small, weak flashes, while, for longer ones, a whole sheet can be used. The tissue paper is soaked in aqua fortis, which should be bought ready-mixed from the druggist. The paper is thoroughly soaked, but is taken out of the solution as soon as possible, rinsed in running water, and hung up to dry. A wooden clothespin, or something of the sort, should be used to remove the paper from the acid, which should be prevented from contact with the fingers or clothing. When the papers thus treated have dried, they are pinned to a stick, held at arm's length and touched off with a match at one corner. They will burn with a brilliant white flash.

Colored flashes are made as follows: In all cases the paper is first treated as described above, and dried before immersion in the chemical solutions that produce the colors.

For red, dip the treated sheets in a solution of water and nitrate of strontium. Blue is obtained by soaking in copper-nitrate solution. Green can be produced from a solution of copper chloride, while a solution of calcium nitrate will produce another red. A beautiful violet flash is made from a solution of saltpeter and water.

Be sure to pin the paper to the end of a stick, which can be held at arm's length, or else fasten to a tin reflector before lighting.



Dining Table Made from a Small Gate-Leg Table

Usually the extension dining table is a cumbersome affair for the small family dwelling in a modern apartment. The illustration shows a table that affords a real economy of space. A small gate-leg table was used, and provided with additional capacity for guests by using the two-piece auxiliary top shown. The thin boards used for making



Above: The Gate-Leg Table and the Two Parts of the Sectional Top. Below: The Sectional Top Hooked to the Small Table

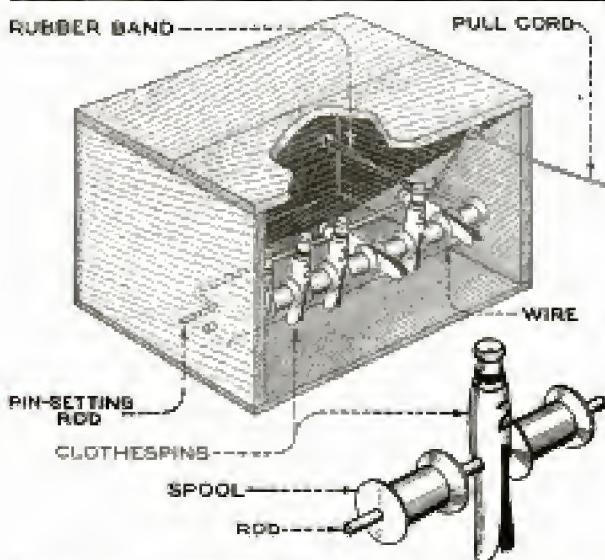
the halves were screwed to wooden battens; hooks were provided for holding the sections together at the center and to the supporting table. The small table will serve for two or three persons, while eight can be seated when the sectional top is used.—Walter C. Harris, Brooklyn, New York.

How to Bleach Beeswax

Pure white wax, which is not only desirable for certain uses but brings a higher price on the market, is obtained from ordinary yellow beeswax. The yellow wax is sliced into thin chips and laid on cloth-covered frames or trays, supported a few inches above the ground, in the open. The flaked wax is turned over frequently, and occasionally sprinkled with clean soft water, if there is insufficient dew or rain to moisten it. The wax should be bleached in about four weeks, but if, on breaking the flakes, the wax still appears yellow on the inside, it is necessary to remelt it and expose a second time or even a third, until it is thoroughly bleached. The time required for proper bleaching depends largely upon the condition of the weather and the amount of sunshine that falls on the wax.

Shooting Gallery for Toy Pistols

Skill in shooting toy pistols, blowguns, and similar harmless weapons that use peas, marbles, or wooden darts for am-



A Pistol Butt for Indoor Use, by Means of Which the Young Marksman can Improve His "Shot," with Harmless Weapons Such as Marbles, Peas, and Darts

munition, can be easily acquired by practicing on a target of the type shown in the drawing. Clothespins, spools, and some wire are about the only materials required. The clothespins, a spool between each pair, are placed on a stiff wire or small rod and fitted in a box, as shown. Back of the clothespins and a little above their lower ends is a second wire that holds them upright; this wire should be placed so that the pins will lean forward a little. When these targets are knocked over by an expert—or lucky—shot, they are caught by the pin-setting rod at the back; this rod is bent from a piece of stiff wire, and is held horizontally by a rubber band. When all the targets have been knocked over, or after each marksman's turn is over, the pins are reset by a pull on the cord tied to the pin-setting rod. If desired, the clothespins can be painted and designated by numbers.—Louis M. Steffen, Dayton, O.

How to Bake a Fish in Clay

A clay-baked fish is so simply prepared, compared with cooking it in camp, that it will be hailed with delight. The best kind of clay to use for the purpose is the gray clay generally found along streams, but in the absence of this, ordinary red clay will answer. The fish is cleaned and washed if desired, and sewed up

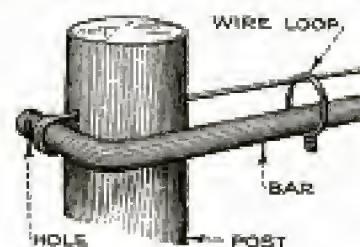
in the ordinary way; the head of the fish may be left on. The clay is packed around the fish so that there will be a 2-in. thickness of it at all points, and it is then ready to be tucked into the fire. Previously, a hot hardwood fire has been kept going; ash is to be preferred because it produces hot coals that last a long time. It is generally a good idea to convert the evening campfire into a heap of coals for the purpose. The fish is placed at the bottom of the coals, covered, and left overnight. In the morning the coals are scraped away, and the hard-baked clay crust broken away with the camp hatchet, exposing the thoroughly cooked fish, savory and palatable to the last morsel. A 5 or 6-lb. fish makes an ideal bake.—Robert Page Lincoln, Minneapolis, Minn.

Swing Stand Used during the Winter

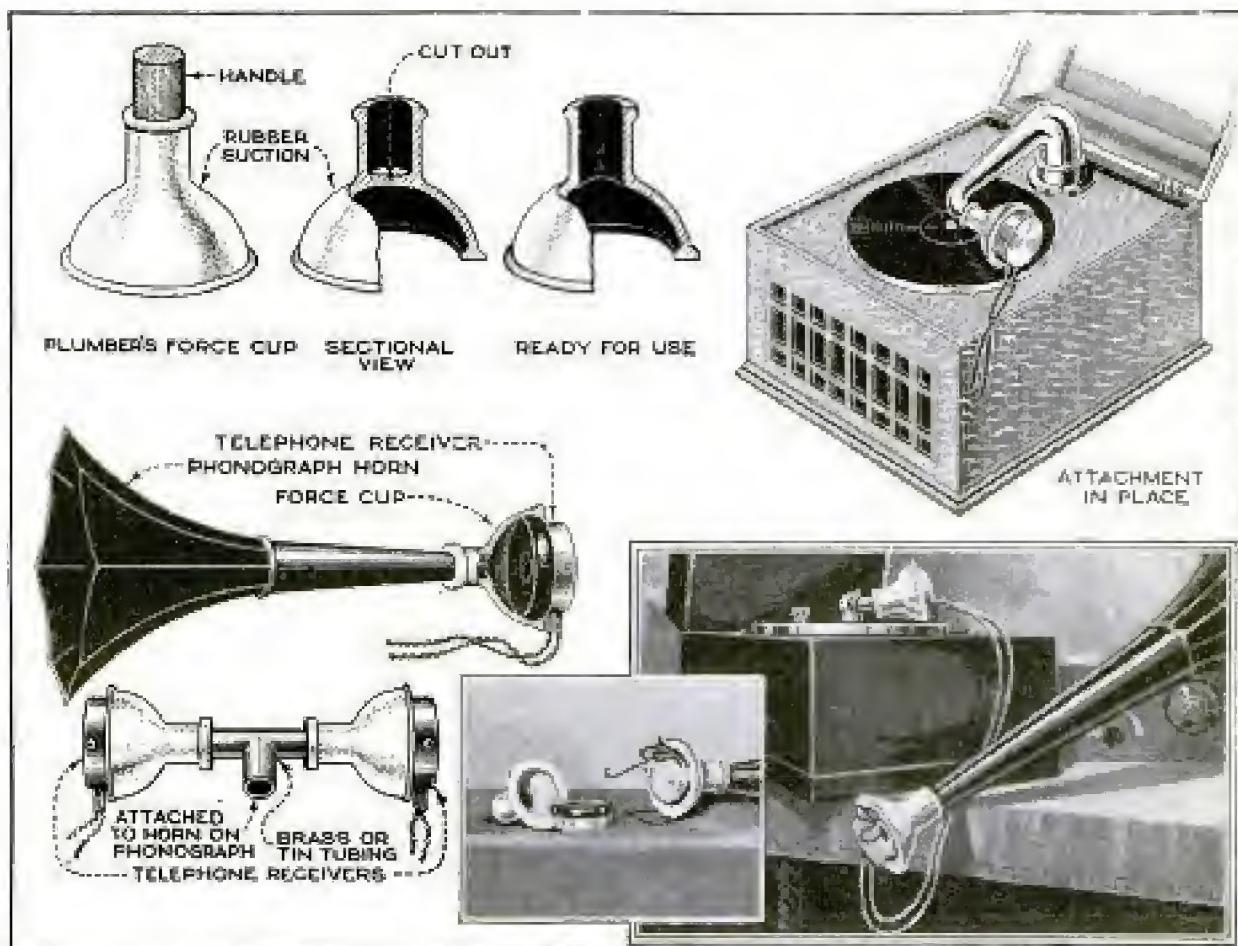
A familiar type of porch swing is suspended from a frame of steel tubing so that it can be moved to any location, either on the porch or lawn. During the winter months, when the swing is not in use, the steel frame can be used to provide additional space for the storage of clothing. This is accomplished by removing the swing from its stand and hanging the clothes—which are placed on hangers, of course—from the horizontal crosspiece.—Mrs. Elizabeth Bachman, Fullerton, Pa.

A Simple Wire Stretcher

A novel arrangement, that is simply installed on any wire line to facilitate lowering or raising, or to maintain a uniform tension, is shown in the drawing. It is made from a bent bar of round iron. The wire is led through a hole in the post and fastened through a hole drilled in the bent bar. Turning of the bar crank winds the wire around it and tightens the line. The crank is held in place and prevented from unwinding by a loose loop, or link, which is slipped over its end.



Such a device is being used, in one instance, to keep wire clotheslines taut, so that no props or other supports are necessary. The wire is led through a hole in the post and fastened through a hole drilled in the bent bar. Turning of the bar crank winds the wire around it and tightens the line. The crank is held in place and prevented from unwinding by a loose loop, or link, which is slipped over its end.



Simple Methods of Making a Loud Talker for the Radiophone-Receiving Set: One or Two Force Cups, with a Few Scraps of Tubing and a Discarded Phonograph Horn, Are the Only Materials Necessary

Making Loud Talkers for Radio-Receiving Sets

A variety of devices for amplifying the sounds received through the radiophones are on the market for the choice of the owner of a radio-receiving set—if he cares to pay the price. If his means are limited, the ideas illustrated may be applied at a cost of well under a dollar.

The only material required is one or more small force cups, such as can be bought from any plumber or hardware store. Usually these cups are mounted on a wooden handle, and this is removed, as the rubber cup is the only part used. Between the handle socket and the hemispherical cup there is a dividing wall of rubber that must be cut out, which makes the cup ready for use. One of the phone receivers is fitted inside the large end of the cup and the neck is slipped over the tone arm of a phonograph, after the soundbox or reproducer has been removed, or over the end of a horn as in the drawing. A larger volume is, of course, obtainable by using both receivers of a headset and mounting them on the ends of a tee.

Efficiency of Spark-Plug Points Improved by Sharpening

As the result of investigation as to the advantage obtained by varying the form of the electrodes through which a high-tension current was passed, it was found that the same voltage would bridge a gap from 25 to 50 per cent greater when the points were made very sharp, than when they were blunt. This knowledge was put into practice on a number of cars in which trouble was experienced due to persistent fouling of the plugs with oil and carbon. As a result of these tests, extending over a year, the invariable practice in one shop, when fitting new plugs, is to file the electrodes to a point, and make the gap the usual thickness, that of a worn dime. The practice has overcome the trouble with the plugs, and has made cylinders, which previously required weekly cleaning of the plugs, operate without a "miss" for months. It is necessary to set the points closer after a long period of operation, as the smaller points burn away quicker than the usual circular-section electrodes. It is most important to sharpen the positive electrode.

How to Make Artificial Pearls

BY R. R. HENDERSON

ARTIFICIAL-PEARL making would seem, at first glance, to be a process somewhat beyond the skill of the amateur, but, as a matter of fact, very good-looking "pearls" can be turned out in the home workshop. The art is not difficult, and can readily be acquired by practice.

For many years, artificial pearls were made by coating the outside of small glass beads with a luster paint. This method, however, had the disadvantage that constant wear caused the paint to chip off, leaving the glass bare. At the present time this method is used for the cheaper grade of goods only. The better and more expensive artificial pearls are now made by first blowing thin glass globules, with a hole in each end, from thin-walled glass tubing. Then, by a special process, the interior of the globule is coated with a luster solution.

First obtain a supply of thin-walled glass tubing of small diameter. The exact size of tubing and thickness of wall depend upon the size of pearls one wishes to make, but for most ordinary uses, tubing of $\frac{1}{8}$ -in. outside diameter and walls $\frac{1}{16}$ in. thick will serve.

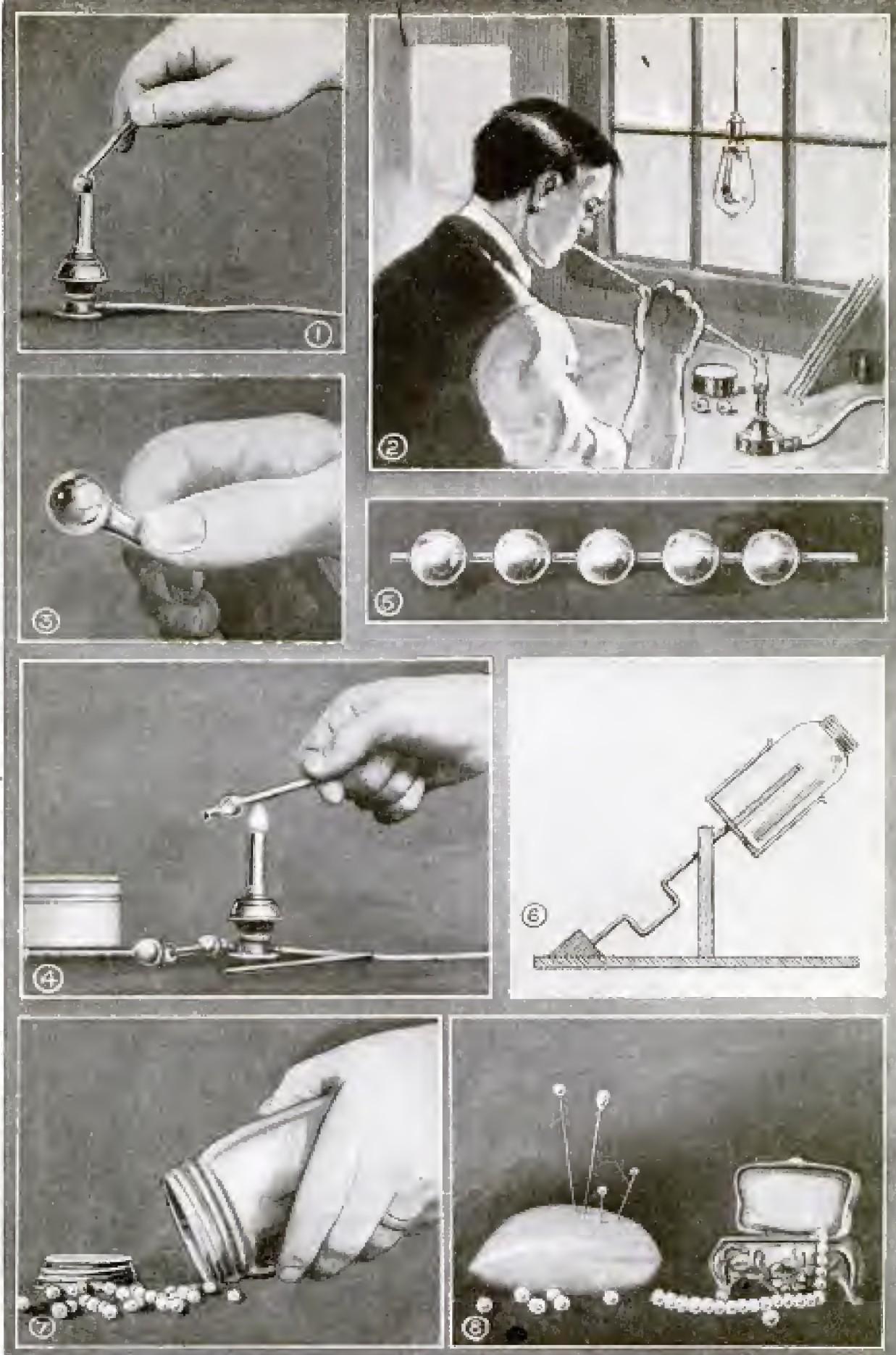
Place one end of a piece of tubing in the flame of a Bunsen burner, as in Fig. 1, and rotate it slowly until the glass melts and runs together, closing the hole in the end of the tube. Remove the tube from the flame and let it cool slightly. Then again insert the tube in the flame, about 1 in. from the closed end, and rotate it slowly so as to heat it uniformly all around. When the glass becomes red-hot and soft, remove it quickly from the flame and blow in the open end, as in Fig. 2, until a bulb or globule of glass appears of the desired size. Be careful not to heat the glass until too soft or to blow too hard, or the bulb may accidentally be blown so thin as to burst it. Also, if the tubing is not uniformly heated all around, the hottest spot will swell out first, and a globule of imperfect roundness will be formed. A complete globule, blown near the end of the tube, is shown in Fig. 4. After blowing the first globule, let it cool a moment so as to set and become hard. Then heat a place on the tube beside the first globule, Fig. 4, and blow another; continue in this manner until as much as possible of the length of the tube has been used, as in Fig. 5. Now, with a small three-cornered file, make a scratch between each globule and break them apart. The small tips left on each end may be ground off by rubbing

on a piece of emery paper, and then polishing with wet chalk, or, preferably, they may be melted and closed in slightly to give a finer hole, by holding the globule in a pair of tweezers and rotating the end in a fine flame. Wash a quantity of the globules in a pint of water, to which a spoonful of washing soda has been added, stirring them around thoroughly; rinse them in three or four changes of clear water to remove every trace of the washing soda, then place them in a pan in an oven to dry. The globules should not be touched by the hands after washing.

Now prepare a very thin varnish by dissolving a small quantity of mastic in acetone. To this add a very little ordinary copal varnish. Then stir into this thin mixture a quantity of "fish silver." This material consists of the carefully dried, ground, and sifted white scales of fish; it may be obtained from dealers in artists' and decorators' supplies. The complete solution, already mixed up, may also be obtained, under the name of "pearl solution" or "essence d'Orient."

Construct a coating apparatus from a glass or enamel-ware jar, as shown in Fig. 6; this is so arranged that it may be rapidly rotated about an inclined axis, and should be equipped with some sort of cover. An ordinary preserve jar serves well. Place in the jar a small quantity of the fish-silver and varnish mixture, and about three times as great a bulk of the glass globules, close the cover, and rotate the jar rapidly. In a few minutes it will be found that the interior of every globule is coated with the luster mixture, and that all the excess liquid will be in the form of drops in the inside of the globules, capillary attraction, assisted by the rubbing of the globules together, which prevents the coating settling and adhering to the outside, having drawn the liquid to the inside. Now heat the jar gently with a gas flame or alcohol lamp, rotating it again rapidly, leaving the cover off. In a short time the excess liquid will have evaporated, leaving on the interior of the globules a hard coating of the luster material, and giving the effect of natural pearls. Care must be taken that the luster varnish is very thin, and that only a small quantity is used, to prevent the excess from sticking to the inside of the jar, or to the outside of the glass globules. If, by any chance, a little of the coating should stick to the outside of the globules, it may be removed by putting them

Essence for making Pearls: - Jayenne's Trade
Name
Wetstone Chemical Co. & Parte



This Is an Interesting Hobby, and Is Well within the Skill of the Amateur

berries - gills - white
Central & western Pacific Ocean

John Powell -

back in the revolving jar, with an equal amount of sawdust which has been slightly moistened with acetone. If the jar is then rotated, the rubbing of the pearls against each other and the sawdust will clean them. They may be polished by rotating in the jar with fresh, clean, dry sawdust. It is best first to sift the sawdust, so that it will contain no grains small enough to get inside the pearls through the small holes. Use the sawdust that remains on the sieve.

Cork Prevents Double Exposures

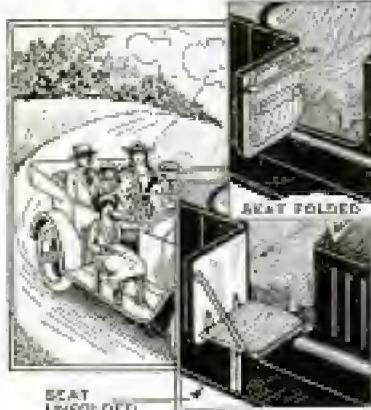
After accidentally bumping the trigger of his box camera a few times and getting double exposures, the owner decided that some step must be taken to prevent this. The method consisted simply in the insertion of an ordinary cork into the opening in front of the lens. This arrangement not only makes the opening light-tight, but permits unlimited tripping of the trigger, and is also dustproof, thus protecting



the lens and shutter mechanism. It should be borne in mind, however, that the cork must not be so long as to bear against the revolving shutter disk.

An Auxiliary Seat for the Auto

Upon occasion it is desirable, especially with a two-passenger car, to accommodate an extra passenger. One method providing this extra seat is that shown in the appended sketch. This consists of a hinged seat attached to one of the right-hand doors as shown, and provided with a hook and leg on the forward edge of the seat, for its support.



a hook and leg on the forward edge of the seat, for its support.

To prepare glass globules for hatpins, seal one end of a glass tube by rotating it in the flame and blow the globule directly from this sealed end; Fig. 3 shows a hatpin globule. When cut from the tube by a three-cornered file, this gives a globule with only one hole. It is coated in the same manner as the ordinary beads. Pins may be fixed in place by imbedding them in a small amount of light-colored melted sealing wax run into the bead around the pin.

This seat has the advantage that it can be folded snugly against the door when not in use.

For roadside tire repairs, or other troubles, this seat provides a handy place to work without stooping, and a shelf for the tools.

Socket Wrench for Connecting Rods

The socket wrench shown in the drawing was made for the purpose of tightening the bolts used to hold the caps of automobile connecting-rod bearings. The space between the cap body and the inner edge of the nut is generally so small that only a very thin socket wrench can be used. The result is that the

wrenches are often broken. For the tool illustrated, a heavy wrench is used, one side being ground off. With this wrench the nut can be drawn up tightly without resort to a hammer and chisel.

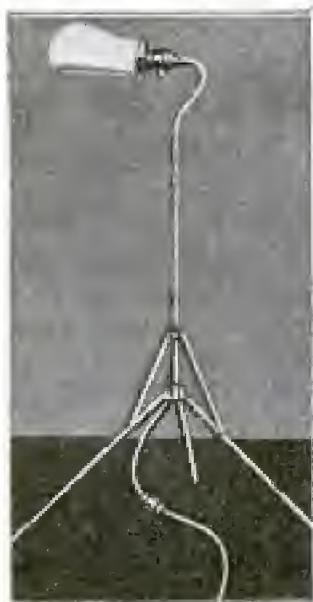
Thought Transference with Dice

A simple arithmetical trick, that is very impressive, consists in asking a member of the party to throw a pair of dice on a table, then telling him what he has "thrown." In order that the person performing the trick may not see the dice, he goes to another part of the room, where he remains until the conclusion of the trick. The performer then requests the person casting the dice to use the uppermost figure on one of the dice and multiply this by 2, then add 5 to the product,

multiply the sum by 5, and, finally, add the uppermost figure on the second dice. When he has done this, the performer tells the number of spots showing on each of the dice, although he has not seen them.

When the performer is told the number that has been obtained by the above process, it is only necessary for him to subtract 25 from it, and the remainder will be a two-figure number; one of these figures will be the number of spots showing on one of the dice, and the second will be that on the other. Thus, for example, assuming that the person tells the performer that his final number is 67, by subtracting 25 from it, 42 is obtained; then the performer knows that the figure on one of the dice is 4 and that on the other is 2. The operation from beginning to end is: $4 \times 2 = 8 + 5 = 13$ $\times 5 = 65 + 2 = 67 - 25 = 42$.—Raymond Dixie, New Haven, Conn.

Reading Lamp Made from Music Rack



that can be adjusted for height and is readily portable.—L. Ringer, Cincinnati, Ohio.

A Camp-Site Incinerator

Proper sanitation is a first necessity in an auto-tourist's camp site. A small garbage incinerator can be built at little expense, and the aid it will render in keeping the place sanitary is well worth the small outlay of labor and materials. The inner lining should be of fire brick, while ordinary bricks, old or new, will serve for facing. Built like an old-

fashioned beehive, the incinerator has a fire grate about 18 in. from the bottom,



Incinerator for a Camp Site Used Mainly by Auto Tourists Helps to Keep the Camp Sanitary and Free of Refuse of All Kinds

with an opening at the top equal to about one-half its diameter at the bottom. After a wood fire has been started under the grate, the refuse is dumped through the top hole, and will be gradually consumed without further attention on the part of the caretaker. Further to facilitate the disposal of refuse, each tourist, as he enters the camp, should be provided with a wire basket in which he is requested to deposit the refuse from his tent.—C. L. Meller, Fargo, N. D.

Sewing Kit Made from a Cigar Box

An ordinary cigar box, preferably one used for holding 50 cigars, provides a good container for spools of thread, and other sewing materials, when fitted up as shown in the illustration. Two long

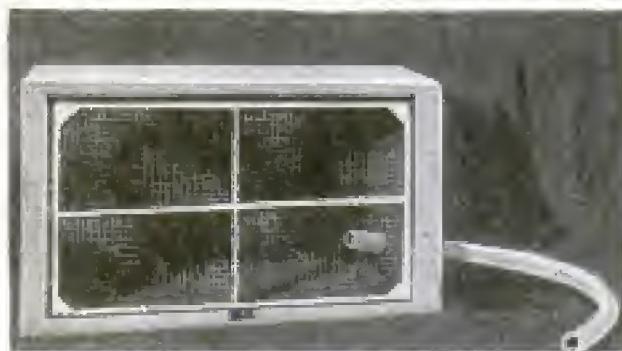


aluminum knitting needles, such as can be obtained for a few cents, are fitted into holes drilled in the ends of the box. In the end at which the knitting needles are inserted, the holes are a loose, sliding fit, while at the opposite end they are a little smaller so that the needles will be held in place by friction. The spools turn freely on the rods, which need never be removed except when an empty spool is taken out to make room for a new one. The remaining space in the box can be used for pin-cushions, scissors, and other articles.

A Novel Photo-Print Washer

A great deal of time is saved by the user of the print washer illustrated, and the prints are thoroughly washed, as they do not come into contact with each other, and each is surrounded by circulating water. Ordinarily, the prints are removed from the hypo fixing solution, dumped into a pan or other vessel, and the water turned on; as the wet prints always stick together more

copper-screen wire, to prevent rusting, and the sides, ends, and partitions are made of narrow strips of galvanized iron, soldered together and to the wire screen. A small strip of wood is placed in the bottom of the box to keep the trays from the bottom, and allow a free circulation of water underneath. The hose that carries the water from the faucet to the washer enters the box at the bottom. In use, a strip of sheet metal is placed over the top and fas-



Above: The Wooden Container and Four Copper-Wire Trays, Each Divided into Four Compartments. Left: Top View of the Washer. Right: Strip of Sheet Metal

Fastened at Each End over the Top of the Washer

or less, there is no assurance that all of the prints are thoroughly washed.

This print washer consists of a wooden box, which serves as a container for four trays, divided into four compartments, one for each print. The trays are made of

tended with buttons on each end of the box, to prevent the prints in the top tray from washing out. Double the number of prints can be washed by placing two, back to back, in each compartment.—John T. Daniel, San Francisco, Calif.

The Care of Leather-Bound Books

Bookbinding leathers have a tendency to dry out and finally break at the hinge, if the leather is not kept flexible by occasional greasing. For this purpose any high-grade vaseline, free from acids, may be used. The following method of greasing the leather is that used in a large library to preserve the sheep bindings of legal volumes:

The work should be done in a well-lighted, airy place, preferably in the summer, when the windows can be opened to let in the outside air. Place the book, back up, on a table having a smooth top, and coat the back with vaseline, rubbing it well into the grain of the leather with the hand. Next, treat the sides and edges, being careful not to get

any of the vaseline on the paper. Use small quantities of vaseline and rub it in well, with a firm, flexible stroke. The first application is usually absorbed rapidly. Next apply a second coat and rub the leather down well as before. The back and back edges require more vaseline than the sides and front edges. Then place the book on a shelf to dry, which takes from 24 to 48 hours, and finally rub off all surplus grease.

Merely dabbing on the vaseline with a cloth and rubbing it off does not suffice. Neither is one application, left to dry in by itself, satisfactory. Light rubbing with cloth pads will not do the work as well as rubbing with the bare hands. Also it is better to use small quantities of vaseline, and make several applications, according to the condition of the book.

Fusible Alloys for Setting Crystals

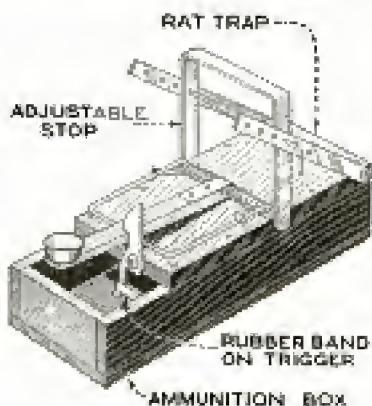
Radio-sensitive crystals, such as galena, silicon, and the like, should be imbedded in metal to obtain the best results, and this is done by using an alloy that melts at a point considerably below the boiling temperature of water. Heat destroys the sensitiveness of the best crystals, and for that reason lead cannot be used.

An alloy which melts at 197° F. is composed of lead, 3 parts; tin, 2 parts, and bismuth, 5 parts. The melting point of the metal can be still further reduced by adding 1 part of warm mercury to the molten alloy when it is removed from the fire. The addition of mercury will cause the alloy to remain liquid at 170° and become a firm solid only at 140°. The boiling point of water is generally taken as 212° F., although the higher the elevation above sea level the lower this temperature will be.

Making a Toy Catapult

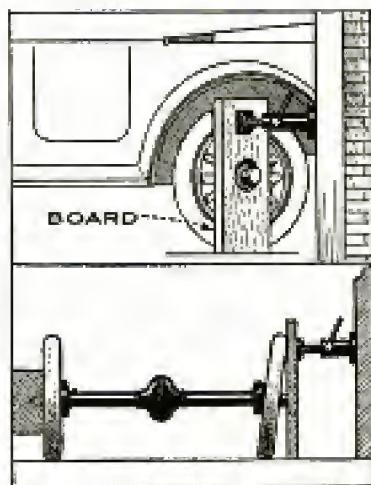
A 10-cent rat trap of the type shown in the drawing can easily be made into a marble-throwing catapult, the range of

the missile being regulated by an adjustable stop. The trap is fastened to the edges of the ammunition box and the bait hook is removed. The stop is then bent from a strip of sheet metal and fastened to opposite edges of the trap as indicated. Two side arms that serve as braces for the stop are adjusted by means of a wire pin passing through holes in the stop and arms. The throwing arm should be made of $\frac{1}{2}$ by $\frac{1}{2}$ -in. hardwood, about 10 in. long, although the length is best determined by trial. A small metal cup at the end of the arm provides a pocket for the ammunition. If desired, a trigger arrangement, similar to that shown, can be added to the device. Flour, tied in tissue paper, may be used to make a realistic bomb, as it gives off a smokelike puff when it strikes, and is harmless. The longest throw the device is capable of, will usually be attained when the stop is set at an angle of about 45 degrees.—J. H. Kindelberger, Cleveland, Ohio.



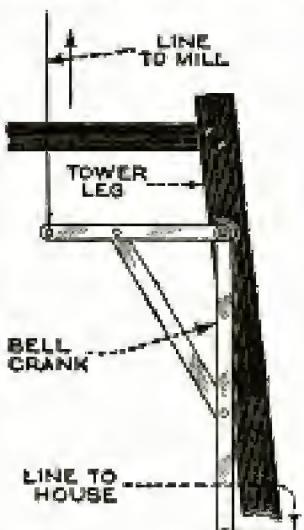
Straightening a Bent Auto Axle

When an automobile skidded into a partly obscured curb, one of the rear-axle shafts was badly bent. The wobble of the wheel was so pronounced that further driving was out of the question. This happened near the garage, and as the use of the car was necessary for delivery purposes, the method illustrated was used to straighten up the wheel. A piece of plank, about 3 ft. long, had a hole cut in its center to clear the wheel hub. Driving the car into the doorway of the brick garage, a jack was placed between the upper end of the plank and the side of the doorway. The opposite wheel was blocked to prevent the car from being pushed sidewise, and pressure exerted on the jack straightened the axle. Repairs made in this manner should not be considered permanent.



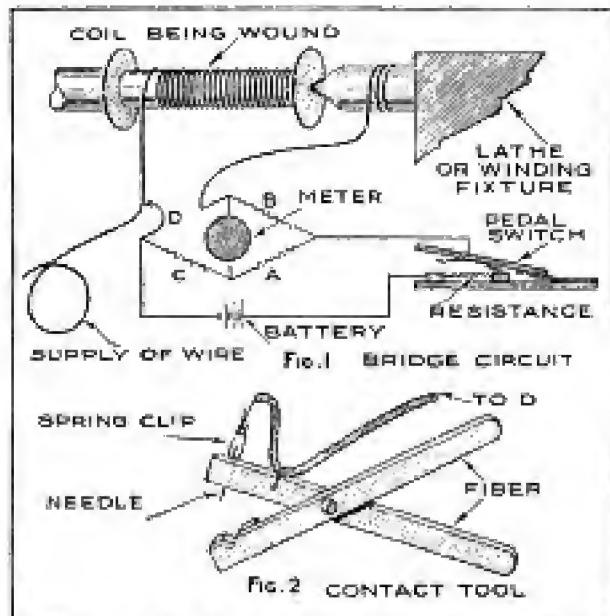
Windmill Controlled from the House

Having to go from the house to the windmill, some 30 rods away, in order to stop it when the tank is full, soon becomes quite a nuisance. To avoid this, and to control the operation of the pump from the house, the arrangement shown by the drawing was worked out. A bell crank made from a piece of tire iron, was pivoted to one of the tower legs with a bolt. Wires fastened to the ends of the crank were led to the house and to the controlling mechanism of the windmill for throwing the pump out of gear. The pump can also be started by releasing the control wire.—Rufus E. Deering, Ottawa, Kan.



Wheatstone Bridge for Coil Winding

To wind electrical coils that must possess a certain resistance, or to wind a coil that will have the same resistance as another, are real problems to the experimenter unless he knows how to go about it. Almost every amateur is familiar with



Winding a Coil of Wire to a Certain Resistance Is an Easy Task When the Wheatstone Bridge Illustrated Is Used

the Wheatstone bridge, by name at least; this is usually represented by four resistances in a diamond-shaped figure, with a battery connected at two of the points of the diamond and a galvanometer across the other two. When there is no current passing through the meter, it shows that the four resistances are balanced, and in proportion; that is, A is to B as C is to D. The voltage of the battery and the markings on the instrument need not be known or correct, as the accuracy of the result does not depend on them. Fig. 1 shows a method of applying the bridge principle to a coil as it is being wound, so that one may know just where to cut off the wire to get the right resistance. The galvanometer should, of course, be as sensitive as possible; it is not difficult to make one from a compass and a coil or two, or an excellent galvanometer can be obtained by removing the resistance coil from any good moving-coil voltmeter, or by connecting direct to the meter so as to bypass the resistance. The resistances A, B, and C must be of known value, if the coil is to be made a definite number of ohms, but if any one of them is of known resistance, two more can be made equal to it, by using ordinary bridge

methods, so that only one known resistance is necessary at the start.

In the figure, the coil being wound forms side D of the bridge; the inner end, or that next the meter, is grounded on the dead center of the lathe or winding fixture, and a temporary contact is made with the last turn wound by piercing the insulation. The pedal switch shown serves two purposes: It connects the battery in the circuit after the contact is made at D, and, as the pedal is further depressed, shorts out a resistance. This resistance is in series with the battery, and should be high enough to protect the meter from the high current which will result if the four sides of the bridge are much out of balance. When the first contact of the pedal switch closes and it is seen that only a small deflection appears on the meter, then the pedal can be pressed farther down, shortening out the resistance and giving greater accuracy in balancing the coil resistance against resistances A, B, and C. Fig. 2 shows a simple and handy tool for making the contact at D. Two pieces of fiber or hardwood are pivoted together at the middle; one is notched, and through the other a sharp steel needle is driven which is connected to the wire leading to the bridge. By laying the magnet wire in the notch and gently closing the needle point against it, the point will pierce the insulation sufficiently to make contact, but without damage of any importance to the cotton or enamel insulation.

Spreader for Split Rims

Automobile owners and drivers generally have trouble in bringing the ends of a split rim together when a new tire

has been placed on it. Various tools are made for this work, but unfortunately, they are not usually carried on the car. The drawing shows a simple method of using the jack, which no motorist is without, and a short block of wood.

Pressure exerted on the rim through the jack and block will force the ends together speedily and easily. A block may be placed under the jack, to protect the rim.—Harry G. Schultz, Teaneck, N. J.

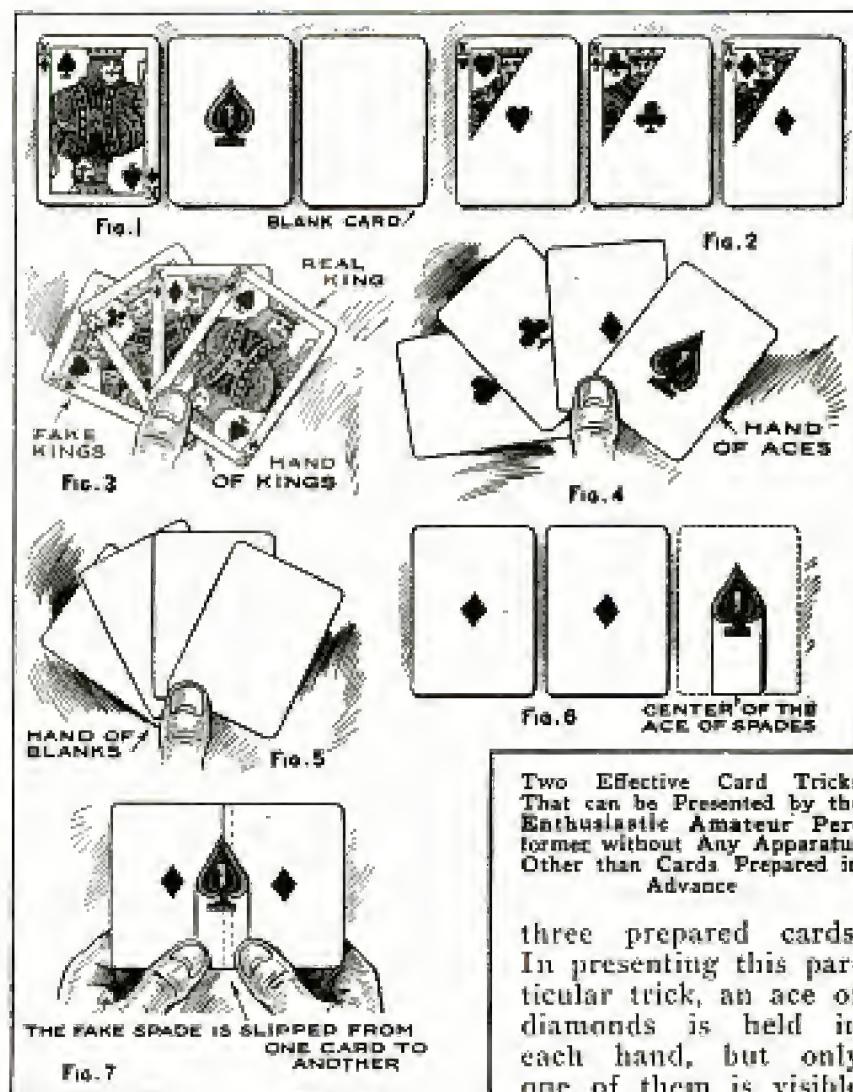


Two Effective Card Tricks

The first trick involves the use of four cards, which are "fanned" out, to show a corresponding number of kings, the performer repeats the magical "abracadabra," and, presto! the same hand has changed to four aces when it is again displayed—a third pass, and only blank cards are shown. Six cards are required for this trick, three of which are unprepared, the other three being "prepared." The three unprepared cards are the king, ace, and blank card shown in Fig. 1, the three other cards being prepared by pasting a part of the remaining three kings over a corner of the aces of their corresponding suits as shown in Fig. 2. In the presentation of this trick, the four kings are first displayed to the audience. The real king being on top, the cards are fanned as in Fig. 3, so as to show only the kings on the corners of the other three cards. Then, the performer picks up the ace of spades, which has been left face up on the table, and announces that he will place it directly behind the king of spades, which he does. He then lays the king of spades on the table. The cards are then closed up and turned over so that the cards are held at what is the top of the cards in the first presentation of the four kings. Then, the cards are fanned out to show the four aces, as in Fig. 4. The index numbers in the corners of the aces should be erased or covered up, otherwise it will be impossible to show the blank cards.

The manipulator now states that by placing a blank card, which he picks up from the table, where the ace of spades is, the spots will disappear from all the cards. The ace of spades is placed on the table, the blank card taking its place. The cards are then closed and fanned out, the hand showing four blank cards, as in Fig. 5. In the second trick, an ace of diamonds is held in one hand and an

ace of spades in the other, but while held in full view of the audience, the cards change places. The prepared cards are made from two aces of diamonds, from which the corner index pips and letters have been erased. An ace of spades is also required, the center of which is cut from the rest of the card as indicated in Fig. 6, which shows the appearance of the



Two Effective Card Tricks
That can be Presented by the Enthusiastic Amateur Performer without Any Apparatus Other than Cards Prepared in Advance

three prepared cards. In presenting this particular trick, an ace of diamonds is held in each hand, but only one of them is visible to the audience, the other being concealed underneath the ace that has been cut from the card. The performer then announces his intention of making the cards change places. He turns the backs of the cards toward the audience, and, with the hands apart, begins moving the cards back and forth, bringing them a little closer to each other at each pass. Finally, when the edges touch, as in Fig. 7, the false center from the card is slipped over and onto the other card; this done, the cards are moved back and forth, gradually separating them, and their faces are again turned to the audience, when, to all appearance, the cards have changed their positions.



BUILDING A SIMPLE RADIO RECEIVER

By F. L. BRITTIN

THE form of receiver described in this article is a very popular one for reception from broadcasting stations; it gives excellent results for distances up to 250 miles and can be built at small cost. Under average conditions, telegraphic signals can be received within a radius of 1,500 miles, on wave lengths from 150 to 400 meters. The instruments are mounted on a $\frac{3}{8}$ -in. bakelite panel, fastened to a wooden base by two angle irons. The variable condenser used is of .001-mf. capacity and is of the panel-mounting, 43-plate type. The vario coupler may either be bought ready-wound, or the knock-down parts are wound and assembled. The stationary bakelite or cardboard tube is wound with 40 turns of No. 20 single cotton-covered magnet wire and six taps are taken off at approximately equal steps; these taps are led off to the contact points of the primary switch, as shown at the upper left. The secondary, or rotor, of the vario coupler is wound with 34 turns of No. 26 single cotton-covered wire, 17 turns on each half, and the leads are brought out, through the hollow shaft, to a pair of binding posts. The tube socket is mounted on the base, at the left of the vario coupler; in front of the socket, the 6-ohm battery-type rheostat is placed, and above it several holes are drilled through the bakelite for observing the brilliancy of the tube filament when in operation. The binding posts for the ear phones are located in the panel directly in front of the socket. The switch for the primary of the vario coupler is mounted on the panel, at the right of the socket, looking at it from the rear, and it should be noted that the switch lever is connected to the ground post. Above the primary switch is located the B-battery switch, which has the "off" point at the right; this switch is for the purpose of varying the B-battery

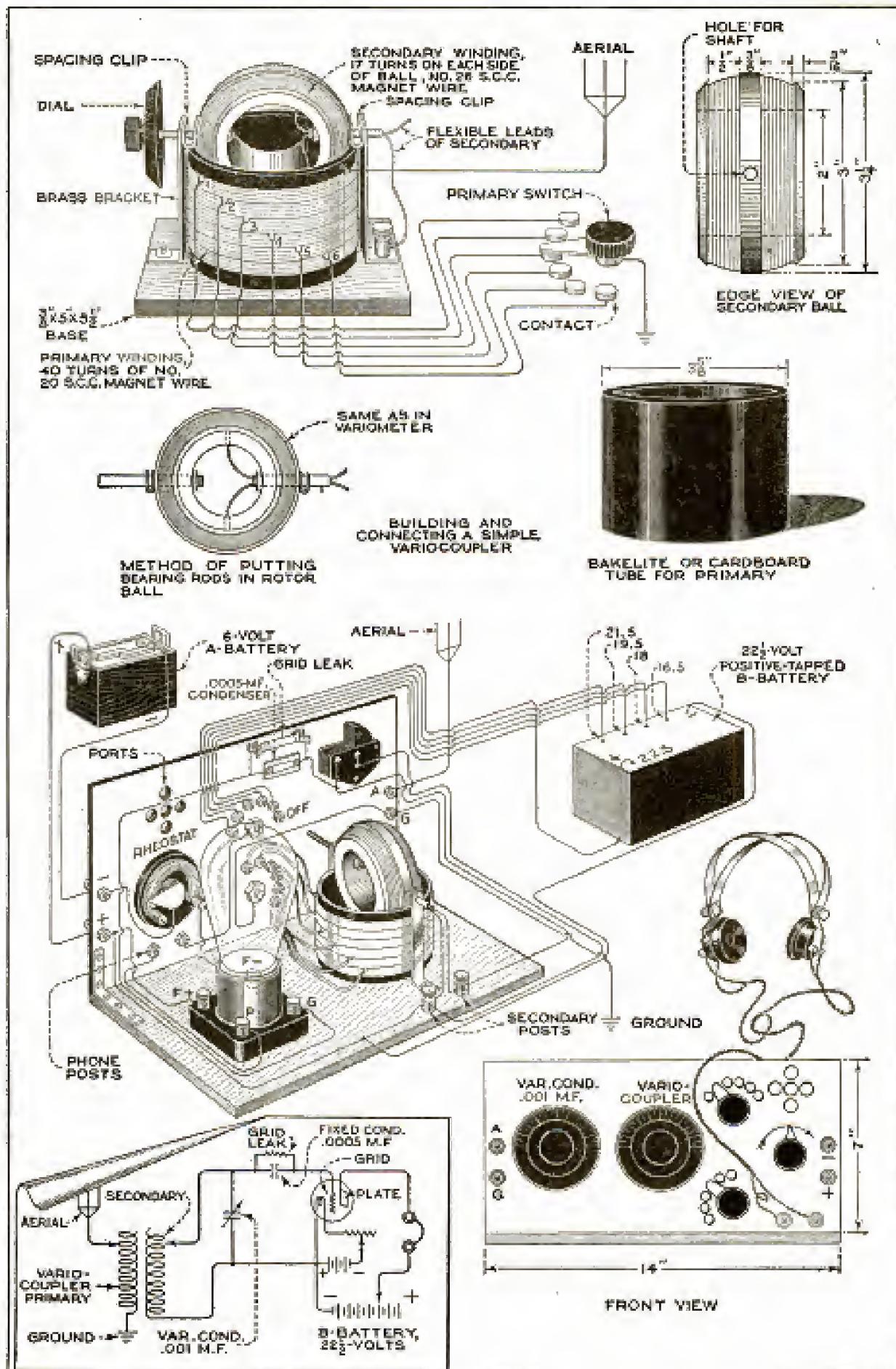
voltage on the plate of the detector tube. The grid condenser is placed on the panel above the vario coupler; this condenser is of standard type with a capacity of .0005 mf. The grid leak has a resistance of 2 megohms, and is of the ordinary type, obtainable from any dealer in radio supplies. Six binding posts are placed on the panel, one for the aerial, one for the ground, two for the A-battery, which is a 6-volt, 40 or 60-ampere-hour type, and the other two are for the ear phones. The B-battery is a positive-tapped $2\frac{1}{2}$ -volt unit of standard make. The taps are connected to the B-battery switch taps on the panel; the various voltages are plainly marked on the battery unit, and should be connected to the switch in the order shown.

Use No. 18 insulated fixture wire for the circuit and carefully solder every connection. Bare, tinned copper wire, with varnished cambric tubing or "spaghetti" slipped over it, can be used, but the fixture wire is cheaper and serves just as well. The detector tube used is a UV-200. The dials for the variable condenser and vario coupler are of standard make.

The proper aerial to use with this type of receiver is one wire, 125 to 150 ft. long, placed from 30 to 50 ft. above the ground. The phones should be wound for at least 2,000 ohms' resistance. If desired, the instruments can be placed in a cabinet, to make a neat and compact set, at the same time protecting the various parts from dust. Many operators prefer the variable condenser in series with the aerial with a receiver of this type, instead of across the secondary, as shown in the diagram, as closer tuning may be had for the radio-phone broadcasting stations. It is suggested that both ways be tried out, to find which best suits the aerial used, as under varying conditions the results will differ.

LIST OF MATERIALS

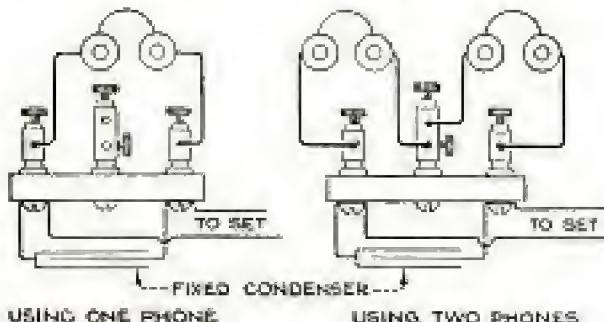
- | | |
|---|--|
| 1 variable condenser, .001-mf. capacity. | 1 wood base, $\frac{3}{4}$ by 6 by 14 in. |
| 1 grid condenser, .0005-mf. capacity. | 1 vario coupler. |
| 1 UV-200 detector tube. | 2 switch levers. |
| 1 tube socket. | 12 contact points. |
| 6 binding posts. | 1 $2\frac{1}{2}$ -volt B-battery unit. |
| 2 angle irons. | 1 storage battery; 6 volt, 40 or 60 ampere-hour. |
| 1 battery rheostat. | 1 pair 2,000-ohm phones. |
| 1 bakelite panel, $\frac{3}{8}$ in by 7 by 14 in. | |



A Simple and Easily Made Receiver for Broadcasting-Station Work: It Has a Wave-Length Range of 150 to 400 Meters, and a Working Radius, for Telephone Work, of 250 Miles. Telegraph Stations can be Heard at a Distance of 1,500 Miles. Standard Instruments are Used Throughout

Block for Multiple Radiophones

When more than one set of phones are used with a radio set, they should be connected in series; it is also best to shunt



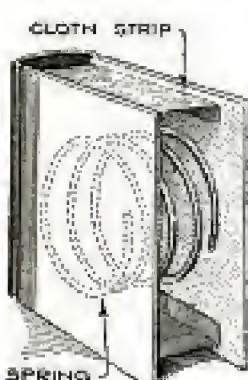
Block for Connecting One or Two Sets of Ear Phones to the Radio Set: The Efficiency of the Phones is Increased by Shunting a Small Fixed Condenser across the Phone Circuit, as Shown

a small fixed condenser across the circuit, as in the diagram.

The block illustrated for connecting the two sets of phones is fitted with three binding posts, which are mounted in a straight line. The central post is of the two-hole type and is left "blind," not being connected in the circuit. The two end binding posts are of the ordinary type and are connected in the circuit in the usual manner. The posts are spaced about $\frac{3}{4}$ in. apart, and the fixed condenser is connected across the two outside ones. When only a single pair of phones is used, the tips are fastened in the end posts, as shown at the left, but when two sets are used, the connections are made as at the right.—W. C. Michel, Jersey City, N. J.

A Bookshelf Accessory

If one or more books are removed from a bookshelf, those remaining have a tendency to fall over sidewise, not only giving the shelf a bad appearance but also allowing dust to accumulate between the volumes. These troubles can be overcome by using an expansion dummy book that will automatically fill the space occupied by the removed book. Such a dummy is made by simply placing a spiral spring between the covers of an old book. Strips of cloth are pasted between the covers at top and bottom to prevent the spring from falling out.—Harry H. Schneekloth, Omaha, Neb.



Restoring Tarnished Headlamp Reflectors

The reflectors of automobile spotlights and headlamps will frequently become tarnished, especially if the car is allowed to be exposed to the weather, dust, smoke, or fumes. A simple means of restoring the reflectors almost to their original brilliancy consists in cleansing them with alcohol and sulphuric acid. To a half pint of alcohol, a tablespoonful of sulphuric acid is added. The reflectors are thoroughly rinsed in this solution for 10 or 15 seconds, after which the surface is washed with alcohol alone, and later with clear water, then polished with a piece of soft linen. It is important that every trace of the sulphuric acid be removed from every part of the lamps, to prevent further corrosion.

A Simple Trouser Press

A device for keeping trousers freshly pressed is easily made from a few strips of light wood, tacked together in the



A Few Strips of Light Wood and Some Heavy-Wire Paper Clips, or Clothespins, Made into a Device for Keeping the Trousers Neatly Pressed

shape shown in the picture. Two such forms are made, one for each side of the folded garment, and these are held in place by means of large wire paper clips or spring clothespins. The press illustrated was made from the slats of an old venetian blind, but, of course, any light hardwood strips will serve.

Feather Dusters for Chick Brooder

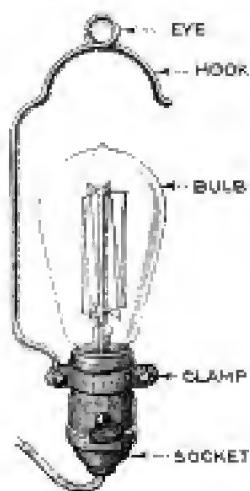
A woman raising and selling poultry bought an incubator in order to increase the number of her chicks, but overlooked the need for a brooder. However, when the eggs began to hatch, she obtained a number of feather dusters, and suspended them from the rafters in the chicken house, so that the feathery ends barely touched the floor. The chicks, just hatched in the incubator, were turned loose among the dusters, finding in them an excellent substitute for a mother hen.—Littell McClung, Florence, Ala.

Identifying Golf Clubs

A good way to mark golf clubs is to coat the end of the handle with a thin layer of sealing wax, into which the owner's initial is impressed with a seal. This method is quite effective, and a short stick of the wax can be carried in the golf-ball pocket of the golf bag, in case the wax should require renewing.—Marion B. Cook, Bellport, N. Y.

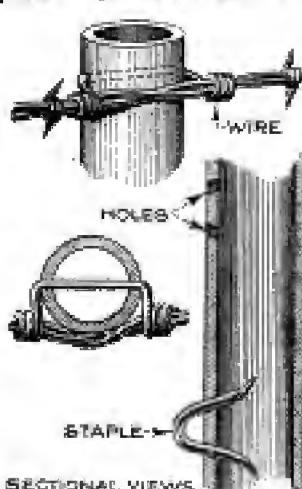
A Handy Electric-Lamp Holder

A simple hook made from wire, and a hose clamp, can be attached to an ordinary electric-lamp socket so that the lamp can be hooked to any convenient projection. The drawing shows clearly how the device is made and attached. Such an arrangement will find many useful applications in the garage, shop, home, or office. If desired, the hook can be turned at right angles to the light.—George O. Reed, Detroit, Mich.



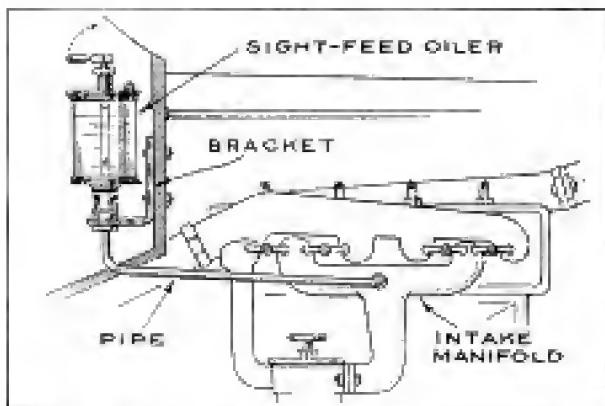
Fastening Barbed Wire to Iron Posts

Occasionally it is desired to attach plain or barbed-wire fencing to posts made of old iron pipe. The simplest way is to drill small holes through the post wherever the separate strands are to come and use wire ties. After the posts are set up, the ties, each about 1 ft. long, are run through the holes and wrapped around the wire on opposite sides of the post. Regular fence staples can be used if the holes are drilled at an angle, so that, when the staple is driven in, the ends will spread apart inside the pipe, and prevent the staple from being pulled out, accidentally, while permitting it to be removed easily, when desired.



Priming the Auto Engine

An ordinary sight-feed oil cup, such as used on most types of stationary engines, affords a convenient means of holding a



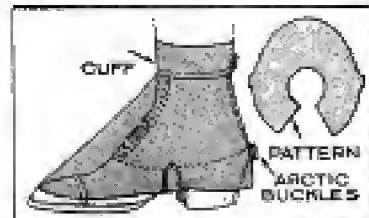
A Sight-Feed Oiler, Attached to the Dash of the Auto, Affords a Convenient Method of Priming the Engine in Cold Weather

quantity of special high-gravity fluid for priming an automobile engine. The oil cup can be mounted on the dash of the car, on a sheet-metal bracket, as indicated, the priming fluid being conducted to the intake manifold of the engine through suitable tubing.

By this method the engine can be primed from the driver's seat without the necessity of raising the hood to inject gasoline into the cylinders through the priming cups. The flow of fluid to the engine is controlled by raising or lowering the snap lever on top of the lubricator. The amount fed is adjusted by means of the nut on the needle valve.

Shoe Guard Prevents Soiling and Damage

Many good shoes have been ruined by acid, oil, paint, whitewash, and other materials, which, had the shoes been suitably protected, would not have injured them. The shoe cover illustrated is made from a piece of rubber, canvas, or other material, cut to shape and fitted with a cuff of the same material, to which the buckles from a pair of old arctics are fastened. A strap fastened to the projecting ears of the guard passes under the instep like a legging strap. The old buckles are at the back and allow the covers to be slipped on or removed quickly.



Trouble Lamp Used as Headlight

A simple expedient, when one or both headlights go out, is to attach the trouble lamp to the underside of one of the



An Extension Trouble Lamp Fastened to the Underside of One of the Headlights Makes Night Driving Safe, and Prevents Arrest for Driving without Lights

headlamps, preferably the right-hand one. Cord, wire, or rubber bands can be used for holding the extension lamp in such a position that the light will shine ahead. This idea makes it possible for the driver to avoid arrest in places where the laws against driving without lights are strictly enforced.

Enlarged Photographic Negatives

The making of numerous enlargements is a tedious and expensive undertaking, when a number of large prints are required from a small negative. The alternative is to make a copy negative from an enlargement, but by this method a considerable amount of the original negative's quality is lost. By the following process, however, large prints that are as good as the negative, can be obtained from small negatives with the rapidity and cheapness of contact printing.

First, an enlargement is made in the ordinary way, but instead of making it on paper a "slow" plate or a piece of commercial film is used; the film being preferable because it is more easily handled. One grade faster than the process plate or film is about right. The process grade is too "contrasty," but may be used when the original negative is lacking in this quality. The enlargement will, of course, be a positive, and should be made slightly flat and dense; in other words, slightly overexposed and carried to a rather full development. The positive is fixed and washed in the usual way. Next, a tray, somewhat larger than the positive, is filled with water. In the bottom a piece of glass, also larger than the positive, is placed. Then, working in the red light, a piece of unexposed film of the same grade as the positive is immersed in the water so that

no air bells form on it, and allowed to remain until it is quite limp. Care must be taken not to touch the face of the film, which should be uppermost, with the fingers at any time.

When the film has become quite limp, it is permitted to settle onto the glass at the bottom. The well-washed positive, still wet, is immersed with a sliding motion to prevent the formation of air bells, but face, or film side, down, and settled on top of the unexposed piece of film or plate, whichever is used, thus bringing the two film sides together. Another piece of glass is slid into the water and brought down on top of the positive, with the two films between. The water is then allowed to remain undisturbed for a moment, until it becomes quiet and no movement is visible. The exposure is made by burning a match about 2 ft. above the tray. If the positive is very dense, two or three matches may be required to get full exposure. The glass is then removed, the films separated and the exposed piece developed, fixed, and washed as usual.

The resulting negative, when properly made, is fully equal in quality to the original, and is not the makeshift usually obtained by copying. While it is possible to let the positive dry and then make a negative by contact in the printing frame, the underwater process produces much better results with the additional advantage of a saving in time.

Brush Hook Made from an Old Saw

A wood cutter uses the hook shown in the picture for cutting brush and small branches, the end of an old crosscut saw being used for the blade.



Finding that his ax was not the proper implement for cutting the brush, he cut a foot from the end of an old crosscut saw and bolted it to a hardwood handle. The back of the blade is sharpened to a cutting edge. This makes a splendid tool for the purpose.

PRISE OFFERS AND ANNOUNCEMENTS

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PAN-PACIFIC COMMERCIAL CONFERENCE TO BE HELD AT HONOLULU, HAWAII

At Honolulu, the capital of Hawaii, centrally situated in the Pacific Ocean, a great gathering of the most influential commercial and financial men from all lands bordering on the Pacific will meet each other daily during the two weeks from October 25 to November 8. At these meetings, held under the auspices of the Pan-Pacific Union, plans will be formulated for future interfacial cooperation in matters of common interest. It is expected that more than a hundred delegates, representing government departments, chambers of commerce, or commercial organizations, will attend, including some from the U. S. departments of Commerce, Agriculture, the Navy, and the Interior. Delegates from similar government departments will attend from Canada, Australia, New Zealand, Japan, China, and other Pacific countries. It is expected that President Harding will sound the keynote of the conference in his message, which is to be read by the governor of Hawaii at the opening session.

Washington, D. C.

PULITZER AND OTHER AIR-RACE COURSES MADE OVER WATER INSTEAD OF LAND

At the third annual aerial contests for the Pulitzer and other trophies, held at Detroit, October 7, 12, 13, and 14, several changes were made in the race courses. For the sake of safety the Pulitzer was changed to a water course. Starting at Selfridge Field, Mt. Clemens, Mich., the course has been made triangular, and 40 miles long, as in previous contests, but easterly over Lake St. Clair instead of westerly over land. Other courses that have been similarly changed are those for the Detroit News aerial-mail trophy, for the Aviation Country Club of Detroit trophy race, and for the Liberty Engine Builders' trophy race. Altogether there are five events at these contests, and \$10,000 in cash prizes, besides which \$30,000 worth of gold and silver trophies are awarded.

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SOCIETY FORMED TO PROVIDE LEISURE FOR BUDDING AUTHORS AND ARTISTS

A new idea of great interest to artists and authors is the formation by a group of Americans and French artists of a society called "Bel Esprit." The originator of the idea, Ezra Pound, a Chicago poet, expresses it thus: "To give an artist leisure to work is actually to take part in his creation." It was with this object that the society was founded, and already one American poet, T. S. Eliot, has been rescued from his unengaging work in a bank, and given leisure for the exercise of his genius. The society first finds the man, and then supports him in leisure, as long as is necessary to develop his talent, by the co-operation of subscribers, who are now being sought in both America and France. The society's address is: Bel Esprit Santuaire, 20 Rue Jacob, Paris, France.

Chicago Tribune 8/10/22

ONE WEEK IN OCTOBER SET ASIDE FOR GOOD-HEALTH PROMOTION

An organized movement for better health that, according to Secretary of Labor James J. Davis, should have the support of every man, woman, and child in America, is being promoted by a large merchandizing group known as the "Good Health Week Promotion Bureau." A campaign being conducted by them will culminate in the week of October 23-30, which has been set aside as a period of national emphasis on health, especially as connected with ventilation, sanitation, and personal hygiene. By lectures, exhibits, and lectures, comprehensive information will be given out on these health subjects in an authoritative but snappy manner, calculated to make the people ask questions. Self-interest in health is the end aimed at. The work is being conducted by the Executive Committee, Good Health Week Promotion Bureau, 209 Grand Ave., Milwaukee, Wis.

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PRISES ARE OFFERED FOR BEST DESIGNS OF THREE CLASSES OF CLOCK CASES

Designers and draftsmen are invited to compete for \$1,200 in prizes offered for the best clock-case designs. Three classes of mantel clocks are required, diagrams and particulars of which will be furnished, and for the three best designs in each class prizes of \$250, \$100, and \$50 will be awarded. The contest is open to everyone, and any number of designs may be submitted. The designs must be delivered not later than Oct. 23, 1922, to Clock Design Competition, Cloister Clock Corporation, Room 1340, 200 Fifth Ave., New York City.

Prize

ENGLISH PUBLISHERS OFFER A REWARD FOR A BOOK OF SELF-REVELATION

For a book of self-revelation an English publishing concern offers £250 advance royalties, and any added royalties that may accrue from the sale of the book after publication. It may be in the form of a diary, a journal, or a novel, and it may be long or short. The writer is to remain anonymous. Truth to life is the feature most desired. Typewritten manuscripts must be submitted, not later than Dec. 15, 1922. Address, Messrs. A. M. Philpot, Ltd., 42 Great Russell St., London, W. C. 1, England.

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U. S. CIVIL SERVICE EXAMINATIONS TO FILL VARIOUS VACANCIES

Competitive examinations for senior engineer, grade 2, and for senior architect, will be held in various cities and towns throughout the United States, and applications will be rated as received until further notice. The initial salaries are \$2,100 to \$2,700 a year, and appointees at salaries of \$2,500 or less may receive a bonus of \$20 a month.

Examinations will be held Dec. 6-7, 1922, for computer, Coast and Geodetic Survey, at a salary of \$1,400 a year for service at Washington, and \$2,000 a year for duty at Manila, P. I., in both cases with the added bonus of \$20 a month.

For junior engineer, junior physicist, and junior technologist, examinations will be held Nov. 22, 1922, for vacancies in the Bureau of Standards at salaries of \$1,200 to \$1,500 a year with the added bonus of \$20 a month.

Applicants for any of the above positions should write at once for Form 1312, stating the title of the examination desired. Address, Civil Service Commission, Washington, D. C., or the Secretary of the U. S. Civil Service Board in the applicant's vicinity.

No. 301-57-38

MONTHLY PRIZES OFFERED FOR PHOTOS BY AMATEURS OR PROFESSIONALS

For the encouragement of pictorial photography prizes are offered monthly by the publishers of American Photography. Not more than three prints may be submitted monthly by any photographer, amateur or professional. Prints must be accompanied by data filled out on a form furnished by the publishers. There are two classes: senior, with prizes of \$10, \$5, and \$3 in value; junior, with prizes of \$5 and \$2. Address, American Photography, 428 Newbury St., Boston 17, Mass.

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PRIZES FOR THE BEST PROFESSIONAL NAME FOR A YOUNG SCREEN ARTIST

With the object of securing an attractive professional name for the young screen artist, Helen Lynch, \$375 in prizes is offered in a "My Name Campaign," now being conducted by The People's Home Journal. Anybody may compete by writing the name on a postal card, signing it, and mailing it on or before Dec. 1, 1922. Any number of names may be sent in by the same person. Address, Motion Picture Editor, The People's Home Journal, 80 Lafayette St., New York City.

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GOLD MEDALS OFFERED FOR EXCELLENCE IN LITERATURE AND KINDRED ARTS

The National Literary Society, recently founded for the purpose of promoting American literature, education, and drama, will award annually a gold medal, properly engraved, to the highest competitor in each of the following nine contests: declaimer, reciter, orator, debater, poet, essayist, novelist, short-story writer, and playwright. The home office of the society is at Washington, D. C., but branches are being organized to cover the entire country, and these contests will be held first in each county seat, the fourth Wednesday of January; then county winners will compete in the largest city in each congressional district, the second Wednesday of February; winners in these contests will compete in the capital city of each state, the fourth Wednesday of February; and a final contest will be held in Washington, D. C., the second Wednesday of March, annually. The contests are open to any member of the society, and any white resident of the United States is eligible to become a member by the payment of an annual fee of \$1. Address, The National Literary Society, International Building, Washington, D. C.

CONTESTS PREVIOUSLY ANNOUNCED

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute.

For Service to City of Philadelphia: Prize \$10,000; announced September issue, 1921; awarded each year by Edward Bok, former editor of *The Ladies' Home Journal*.

One Million Francs for Best Motor: Announced January issue, 1922; closes June 1, 1923; address, Aero Club of France, Paris.

Research Thesis by a Woman: Prize \$1,000; announced October issue, 1921; awarded annually; ad-

dress, Dr. Lilian Welsh, Goucher College, Baltimore, Maryland.

Annual Commercial Airplane Contest for "Italy's Great Trophy": announced July issue, 1922; address, Aero Club of Italy.

Ideas for New Occupations for Shut-Ins: Prizes, \$100, \$50, and \$25; announced July issue, 1922; closes Nov. 1, 1922; address, Prize Editor, Popular Mechanics Magazine, 6 North Michigan Ave., Chicago.

Fishing Contest: Prizes, seven "Model 94" Winchester hunting rifles; announced July issue, 1922; no definite closing date.

Best Novel by an American Author: Prize \$2,000; announced August issue, 1922; closes March 1, 1923; address, Harper & Brothers, New York City.

Designs for Chicago Tribune Building: Prizes, \$100,000; announced August issue, 1922.

Best Essay on a Historical Novel: Prize \$100; announced September issue, 1922; closes Dec. 1, 1922; address, Kenyon College, Gambier, Ohio.

Competition for American Composers: Prizes from \$1,000 to \$100; announced October issue, 1922; closes Dec. 15, 1922; address, Mrs. Edwin B. Garigues, Room 201, Bellevue-Stratford, Philadelphia, Pa.

Best Symphonic Composition: Prize \$1,000; announced October issue, 1922; closes Jan. 1, 1923; address, Balaban & Katz, 175 N. State St., Chicago, Illinois.

For Musical Compositions: 24 prizes; announced October issue, 1922; closes Dec. 1, 1922; address, The Etude Prize Contest, 1712 Chestnut St., Philadelphia, Pa.

A new variety of winter apple, originated by the Minnesota State Fruit-Breeding Farm, is not grown from seed as stated on page 203 of our August issue, but by budding and grafting. This apple is attracting considerable attention from orchardists.



AMERICA'S LARGEST CITIZEN TAKES AIRPLANE SPIN

IT is seldom that a private citizen would dare to make light of an intrepid airmen, yet that is what giant Johan Asson was doing to Pilot Horchem shortly after their descent from a 1,500-foot height to which they climbed. In the course of the flight the pilot played a few tricks on the giant, and the giant showed some of his own tricks to the pilot. The flight was made under a wager that with the giant in the cockpit, the "Swallow" would never get off the ground. However, at the end of five minutes they had climbed to an altitude of 1,500 feet, a most remarkable feat for a ship the size of the "Swallow," considering the load.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]

Sensational! Revolutionary!

It had to come! Quill, wood, hard rubber—all have been used for pens. And now comes metal—so durable, so light, so superior in taking beautiful engraved designs.

In the WAHL PEN, the fine quality metal and Wahl precision are so exceptional, that the metal barrel can be made thinner than in other pens of the same size. This gives extra ink capacity. The tough, sturdy barrel and cap will not crack or split. This means long life.

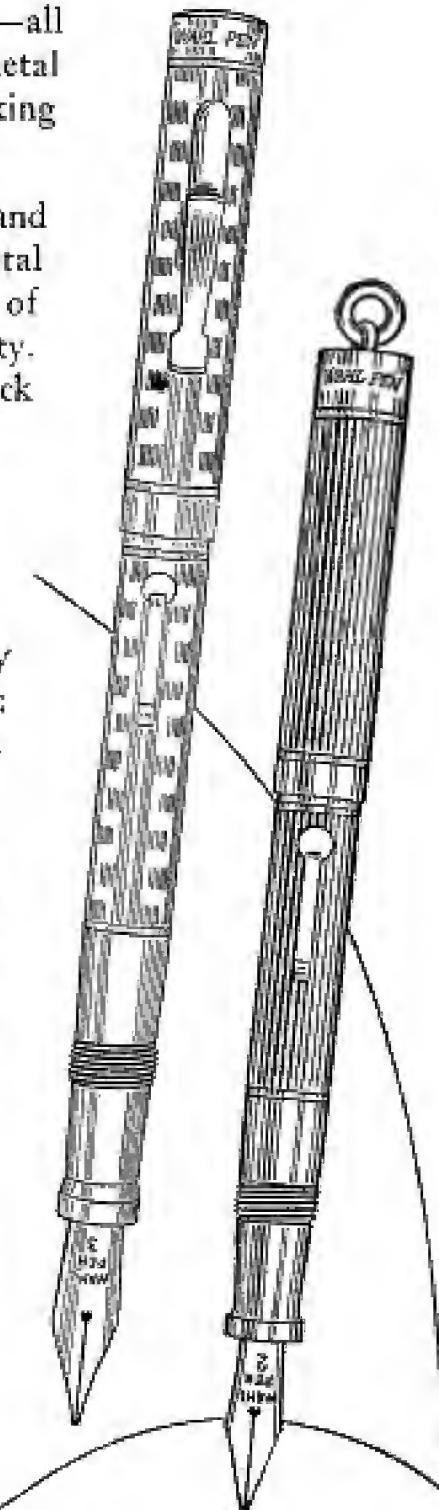
WAHL PEN

The all-metal barrel cannot expand under body heat. The metal threads cannot jam or break: they hold the cap on air-tight, and keep the pen leak-proof.

Lay it alongside any other pen, and appearance alone will sell you the WAHL PEN. The chased or engine-turned designs are beautiful. They match those on EVERSHARP—its write-hand mate. In gold or silver, singly, or with EVERSHARP in velvet-lined boxes, they make the perfect GIFT. Sold everywhere.

Made in U. S. A. by THE WAHL COMPANY, CHICAGO
Canadian Factory, THE WAHL COMPANY, Ltd., Toronto

*Indestructible
all-metal barrel
holds more
ink*





Dividend checks from the American Telephone and Telegraph Company are received quarterly by more than 200,000 telephone users.

Owned by those it serves

Less than fifty years ago an application was made for a patent which created the possibility of speech between distant points. It was the culmination of years of study, research and experiment. It suggested a new aid in commerce and domestic life; a new tie to bind the people together. But it was only a suggestion—a dream.

To make that dream come true required the creation of an organization unlike any other. It demanded a kind of scientific knowledge that was yet to be formulated, as well as a type of equipment still to be devised. And it necessitated the financial and moral support of many communities.

Out of this situation grew the Bell System, bringing not only a new public service, but a new democracy of public service ownership—a democracy that now has more than 200,000 stockholders—a partnership of the rank and file who use telephone service and the rank and file employed in that service. The American Telephone and Telegraph Company exists

to serve the people and is owned directly by the people—controlled not by one, but controlled by all.

Evolution is going on. Each year the ownership is more widespread. Each year the various processes of the service are performed more efficiently and economically. Each year new lines and extensions are constructed. The responsibility of the management is to provide the best possible telephone service at the lowest possible cost and to provide new facilities with the growth of demand. To do these things requires equipment, men and money.

The rates must furnish a net return sufficient to induce you to become a stockholder, or to retain your stock if you already are one; after paying wages sufficient to attract and retain capable men and women in the service. They must adequately support and extend the structure of communication.

These are considerations for the interest of all—public, stockholders, employees.



"BELL SYSTEM"
AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

One Policy, One System, Universal Service, and all directed toward Better Service



"I don't need three hands with the 'YANKEE' Bench Drill"

"No hand feeding with the 'Yankee' Bench Drill. The 'Yankee' friction and ratchet feed does away with that. Pressure is automatically regulated for all drills from the smallest up. Think of the drills I save!"

"One hand steadies the work

on the table—the other turns the crank. That's all the attention I have to give it."

"Friction feed rapidly runs drill down to the work. Ratchet feed then goes into operation. Automatic throw-off prevents jamming."



TOOL Book FREE

Illustrates and describes all the ingenious "Yankee" Tools for saving time and labor. Write for it today!

No. 1005 (illustrated). Two speeds; 3-jaw chuck; holds drills up to $\frac{1}{2}$ in. diameter. Entire length, 28 in. Extends below top of bench 6 in.

No. 1003. One-speed; 3-jaw chuck; holds drills up to $\frac{1}{4}$ in. Entire length 18 $\frac{1}{4}$ in. Extends below top of bench 4 $\frac{1}{4}$ in.

Dealers everywhere sell "YANKEE" Tools

NORTH BROS. MFG. CO.

Philadelphia



"YANKEE" Vise No. 990

Designed for use on Bench Drills. Machined true on ends, bottom and sides. Swivel jaw for taper work. Jaws open 5 in.

"YANKEE" TOOLS

Make Better Mechanics



Boys today—men tomorrow!

THOUSANDS of young men from 20 to 30 years old, who are to-day making great strides in engineering, chemistry, and other sciences were Gilbert Toy boys just a few years ago. I have watched their progress with intense interest and I will tell you that I am mighty proud that my engineering toys have started them on the road to success. When I was a boy I loved to play with scientific things myself, but no one made the kind of toys that I wanted so I said that some day I would make for a new generation of boys, toys that I wanted when I was a kid.

That is why there are wonderful Gilbert Toys for all kinds of scientific fun, electrical sets, telegraph sets, signal engineering, weather bureau outfitts, civil engineering, hydraulic and pneumatic engineering, light experiments, sound experiments, glass blowing, mineralogy, magnetism, as well as all kinds of magic outfitts, and sets to perform tricks with coins, handkerchiefs and cards. There is a Gilbert Toy for every boy. They range in price from \$1.00 to \$30.00.

Erector is the leader. It is the most wonderful construction toy in the world. Boys can make wonderful machines, bridges, cranes, towers. In fact any engineering feat can be duplicated with a Gilbert Erector. The \$5.00 sets have a sturdy electric motor that will lift 200 pounds. That is the toy most boys pick for it is the most popular toy in the Gilbert line.

If you want to know more about Gilbert Toys, send 10c for the Gilbert 1923 Year Book. It not only contains wonderful articles on radio, magic, sports, chemistry and engineering that will delight the heart of any boy, but it is also a complete catalog of Gilbert Toys.

A. C. GILBERT, President

THE A. C. GILBERT COMPANY

104 Blatchley Avenue

New Haven, Conn.

In Canada

The A. C. Gilbert-Menzies Co. Limited, Toronto.

The A. C. Gilbert Co.,
104 Blatchley Avenue,
New Haven, Conn.

Enclosed is 10c. Send the
1923 Year Book to

Name

Street

City

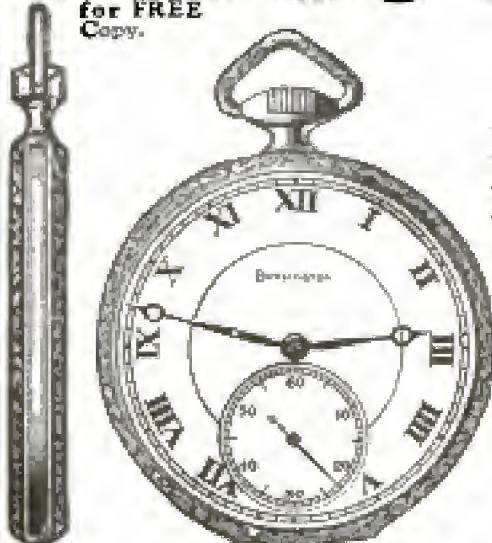
State

GILBERT TOYS

21 Jewel Burlington

Just Out

Latest Designs in
Watch Cases beau-
tifully illustrated in
our booklet. Send
for FREE
Copy.



Adjusted to the Second
Adjusted to Temperature
Adjusted to Isochronism
Adjusted to Positions

New Ideas in Thin Cases

21 Ruby and Sapphire Jewels
25 Year Gold Strata Case

Your Choice of Dials
(Including Montgomery R. R. Dial)

Only \$100
Down

Only One Dollar Down will buy this masterpiece of watch manufacture. The balance you are allowed to pay in small, easy, monthly payments. The Burlington — a 21-Jewel Watch — is sold to you at a price much lower than

that of other high-grade watches. Besides, you have the selection of the finest thin model designs and latest styles in watch cases. Don't delay! Write for the FREE Watch Book and our SPECIAL OFFER today.

Write While This Special Offer Lasts

Get the Burlington Watch Book by sending this coupon. Find out about this great special offer which is being made for only a limited time. You will know a great deal more about this book. You will be able to "steer clear" of the over-priced watches which are no better. Remember, the Burlington is sent to you for only One Dollar down, balance in small monthly payments. Send the coupon for watch book and our special offer TODAY!

Burlington Watch Company
Dept. 1358, 19th Street and Marshall Blvd., Chicago
Canadian Address: 62 Albert Street, Winnipeg, Manitoba

Burlington Watch Company

Dept. 1358, 19th St. and Marshall Blvd., Chicago

Canadian Address: 62 Albert St., Winnipeg, Manitoba

Please send me (without obligations and prepaid) your free book on watches with full explanation of your \$1.00 down offer on the Burlington Watch.

Name _____

Address _____



HANES GUARANTEE:

We guarantee Hanes Underwear absolutely—every thread, stitch and button. We guarantee to return your money or give you a new garment if any seam breaks.

5 HANES *features that will appeal to you*

- 1 Hanes Staunch Elastic Shoulders are made with service-doubling lap seams. They fit right, with plenty of "give."
- 2 Hanes Tailored Collarette won't gap or roll. Fits snugly around the neck and keeps the wind out.
- 3 Hanes Elastic Cuffs are made far stronger and better than the usual cuff. They fit the wrist firmly and won't焉e or rip.
- 4 Hanes Closed Crotch is cut and stitched in a special way that really keeps it closed.
- 5 Hanes Elastic Ankles hold their shape through repeated washings. They never bunch over your shoes.

THese big features alone are enough—to give men folks a friendly feeling for this high-grade, popular-priced winter underwear. But there are other important Hanes features too—strain points that are strongly reinforced; flat, non-irritating seams that hold fast; buttons that actually stay put; buttonholes that keep their shape. *And all covered by the Hanes money-back guarantee.*

If you want underwear this winter that will give you perfect comfort and long wear—and at a very low price—buy Hanes.

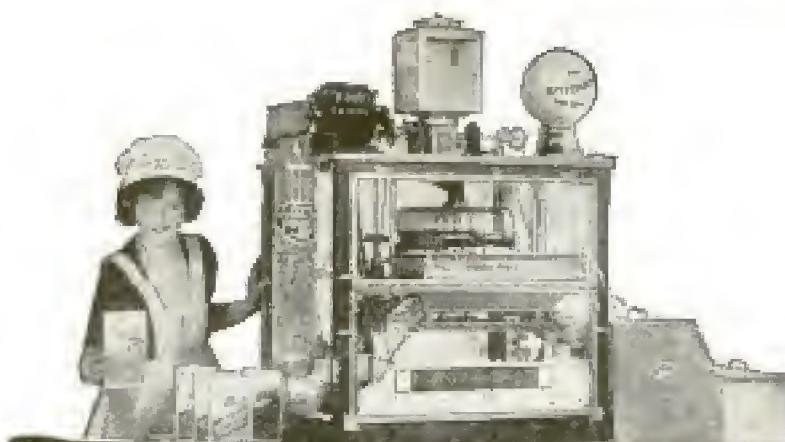
The Hanes winter underwear line includes heavy-weight shirts and drawers and heavy union suits in two weights.

Hanes for Boys: Two weights—heavy and extra heavy. Sizes 2 to 16 years. Also knee length and short sleeves.

If your dealer can't supply you, write direct to us.

P. H. HANES KNITTING COMPANY
Winston-Salem, N. C.

Next summer wear Hanes full-cut athletic Union Suits!



Before you turn this page, write for our "Location Chart" that will tell you approximately how much profit you can make the Butter-Kist Way in your location. Fill in and mail the coupon. It may solve your problem of how to increase your profits. Send the coupon today.

ADD FROM \$600 TO \$5000 A YEAR TO YOUR STORE PROFITS!

WHY worry about lessened profits from your store? Here's an easy way to increase your profits every month in the year!

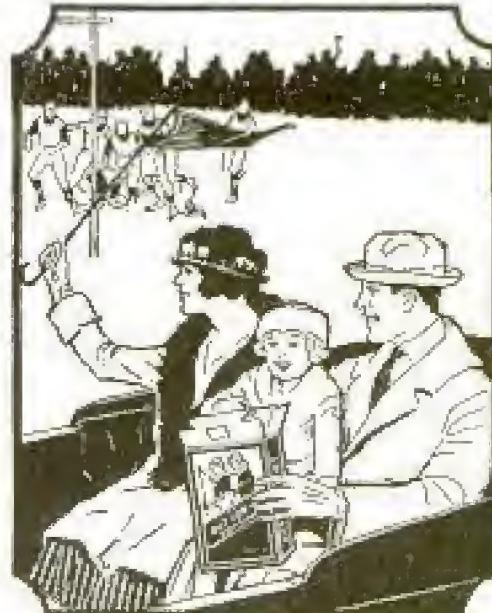
Place a Butter-Kist Popcorn and Peanut Machine in your store in unoccupied space—sell these tasty treats to every customer. And the space required? That's easy! Any store has enough space because the machine takes up little room.

And the profits? Out of every dollars' worth of Butter-Kist Popcorn you sell, 70 cents is yours to keep!

It's so easy to make steady customers because everybody likes the delicious taste of Butter-Kist products. People will come back to you again and again for more. That's why you can sell dollar after dollar's worth, day in and day out. Just remember, Popcorn and Peanuts are big sellers everywhere.

Steady streams of customers every day tell why merchants all over America are averaging from \$600 to \$5000 every year with Butter-Kist Popcorn Machines. If others can do this—so can you.

HOLCOMB & HOKE MFG. CO.
World's Largest Manufacturers of Popcorn Machines and Peanut Toasters
2124 Van Buren St. Indianapolis



BUTTER-KIST Popcorn
"America's Oldest Treat"

HOLCOMB & HOKE MFG. CO.,

2124 Van Buren St., Indianapolis, Ind.

Please send me, without obligation on my part, your free Butter-Kist book, "America's New Industry." I also want the Location Chart which I will fill out and return to you.

Name _____

Address _____

City and State _____

Business _____

BUTTER-KIST POPCORN AND PEANUT MACHINES

Get Big OFFER!

New 1923 Model-Throttle Governed

The Standard By Which All
LOG SAWS Are Judged.



One Man Log Saw

Saws Faster Than Any Other Log Saw.

USES CHEAPEST FUEL—Kerosene, Gasoline, Distillate

Send today for New Special Offer on this Fastest Cutting, Most Powerful, Easiest Moved One-Man Log Saw. More OTTAWAS used than all others. Saw more wood with greater ease, using cheapest fuel. 4 H-P makes 350 saw cuts a minute; that's governed. Learn how easy it is to earn an OTTAWA and how others are making big money in spare time, selling wood during coal shortage.

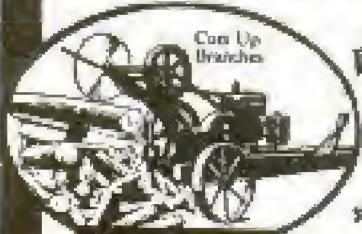
Run Saw Fast or Slow. Now, with New 1923 Model, you can run saw fast or slow while cutting. Easy to change speed while the saw runs. Easy, now, to cut small as well as large logs. Quick and easy to operate new Speed Changer.

Saws the Human Way. The New 1923 Model OTTAWA has a Power Force Feed. Saws an 8 men would only many times faster. The OTTAWA not only makes more cuts a minute, but cuts deeper into the log each stroke.

MECHANICALLY OPERATED VALVES
Now, inlet as well as exhaust valves opened mechanically—like automobiles and tractor motors—not used on other log saws. Makes engine easier to start, uses less fuel, develops more power. Exclusive feature 1923 model.

SPECIAL CLUTCH—

Lever Controlled Friction Clutch enables you to start and stop saw while engine runs. 4-cycle frost-proof engine. When magnetos equipped, no batteries ever needed. Mounted on wheels with swivel axles—easiest to move.



Cuts Down Trees
Level With Ground



ORDER NOW! We will ship immediately from our Factory or from Branch Houses nearest you: St. Paul, Minn., Indianapolis, Ind., Dallas, Texas, Pueblo, Colorado, Albany, N. Y., Pittsburgh, Pa., Atlanta, Ga., San Francisco, Cal., Portland, Ore., Ottawa, Kans. Save one-half to one-third on freight; get outfit sooner—better shape. Send for Special Offer Today.

Saw Wood Beat Coal Shortage! Make Money

Get your OTTAWA Log Saw, now, and let it pay for itself as you use it. Now, with the whole country facing most serious coal shortage in history and coal higher than ever before the OTTAWA will be a blessing to many. If you act at once you can get your own fuel free. You can make Big Money on every cord you sell and keep your friends from suffering.

Latest Offer! Send at once for Big Special Offer and New Reduced Prices. Learn how to make Big Money—easy.

Free Book! Send today—a postcard with your name and address will do. Register the first to get a new 1923 OTTAWA Log Saw.

OTTAWA MFG. CO.,
1748-R Wood St., OTTAWA, KANS.

Exclusive Features
of the Best Log Saw
Ever Built:

Saws Fastest
Easiest To Move
Most Powerful
350 Saw Cuts a
Minute
Saws Human Way
Saws Fast or Slow
as you wish
Clutch Control
4 H-P (and you need
all this power)

**FREE
WOOD
SAWING
ENCYCLO-
PEDIA**

60% of Market Price will buy Diamonds here

4265
 $\frac{3}{4} - \frac{1}{16}$ Ct.
Perfectly Cut

\$275
No - 2 ct.
Blue White

\$69.00
2 Ct. Gold
Color

\$195
White Gold
Colored Diamond

\$50.00
1/3 Ct.
White Gold

\$250
1/8. 1/4 Ct.
Blue White

\$45.00
Colored Center

\$57.00
All Platinum
Wedding Ring

\$9.80
American
Manufactured

Why Pay Full Prices Costs Nothing to See

This famous 75-year old firm—the Largest and Oldest Diamond Banking Institution of its kind in the world—must sell the diamonds on which we loan money. This firm rated highest, at over \$1,000,000.00 capital, having made loans on diamonds, watches, other jewels, in unpaid loans and other special advantage bargains that we must sell to get back our cash. Buy here where loan values the price book, not market value. Send now for bargain list.

FREE—On Approval! *The Buys of a Lifetime!*

The diamond bargains pictured here are merely a few of the many unusual offers on our lists, all with full and complete descriptions. At our risk—we send you any bargain you wish for Absolutely FREE Examination. No obligation. Compare it carefully, have it valued any way you wish. If you decide not to buy, you are not out one penny.

As Low As \$60 Per Carat

Not all, but some. Yes, some even lower priced, but also diamonds of finest qualities at higher per carat charges. Get a diamond now around half its market price.

Send for Latest List of Diamond Loans

Unlike the ordinary catalog, Hundreds of Diamond Bargains described in full detail with exact weight, color, quality, etc. You know what you're buying before you buy. Besides it tells of Guaranteed Loan Value, unlimited exchange privilege at full price paid, and complete details of free examination offer.

Use Coupon NOW!

We'll send our latest Bargain List. It's free. No obligation. No expense to you. Write Now!

Jos. De Roy & Sons
1952 De Roy Building
Only Capitalist Real Estate,
Pittsburgh, Pa.

References by permission:
Bank of Pittsburgh—N.
A. Mellon Nat'l Bank
Union Trust Co.,
Pittsburgh, Pa.
Your bank can
look us up in most
citable agencies.

Jos. De Roy & Sons
1952 De Roy Building
Only Capitalist Real Estate
Pittsburgh, Pa.

Cashman: Please
send me free and pre-
paid, your latest bar-
gain list of diamonds,
watches and other jew-
elry. It is understood I
assume no obligation of
any kind.

Name—

Guaranteed Cash Loan!

Diamonds bought here are like insurance policies. You know what you can expect before you decide to buy—**NEVER CASH BACK GUARANTEE!**





Choke off that "squawk"

AFTER all it is not always the bad vaudeville actors that "get the hook." Many owners have found an efficient hook to choke off the "squawk" of their radio sets and secure enjoyable music by adding Acme Audio Frequency Amplifying Transformers to the ordinary detector unit. Acme Transformers cost but five dollars, yet the results are almost marvelous. Not only do they amplify sound, but they bring it naturally—realistically. They are necessary to the proper operation of the Acme Clear Speaker which enables a whole roomful of people to enjoy the broadcasting concerts.

In order to get more than one broadcasting station and thereby pick out the concert you like best, you should also add an Acme Radio-Frequency Transformer. This greatly increases the range of your set whether it be vacuum tube or crystal detector type. This wonderful little transformer sells for the same price as its twin brother the Acme Audio Frequency Amplifying Transformer. Your set is not complete without both these transformers and the Acme Clear Speaker.

The Acme Apparatus Company (pioneer transformer and radio engineers and manufacturers) also make detector units, the Acmetone, Acme C. W. and Spark Transmitters, etc. Write for interesting Transformer booklet if your own radio or electrical dealer cannot supply you. The Acme Apparatus Company, Cambridge, Mass., U. S. A., New York Sales Office, 1270 Broadway.

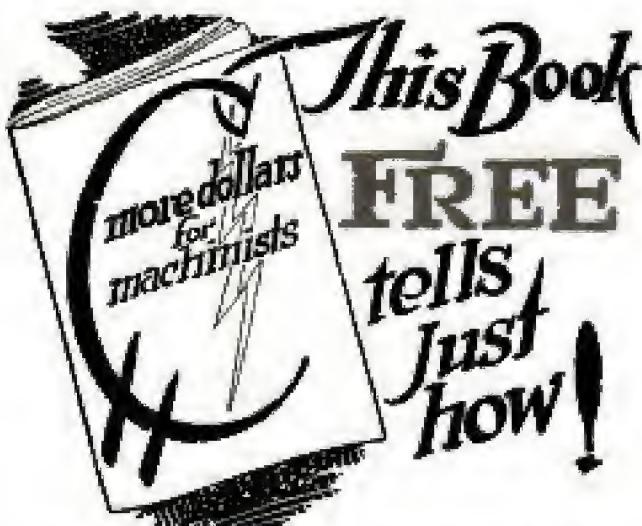


Type A-2 Acme Amplifying Transformer
Price \$5 (East of Rocky Mts.)

ACME
for amplification

Machine-Shop Men can now Cash In On Radio

Practical hints in free book tell just how to profit big from nation-wide craze. Big new money-making field opened to machinists everywhere.



Huge Demand for Radio Panels

Every real radio-fan insists today upon one certain material for paneling his outfit; and cutting that material to dimensions is as profitable and practical a job as any machine-shop can ever make money doing. The makers of that material, wanting reputable machine-shops to cash in on this proper preference of radio enthusiasts, have prepared a handy little book which gives the machinist all the particulars he wants to open up for him this immensely profitable new field. A copy is yours for the asking.

Wonderful Money-Maker for Machinists

This supremely demanded material comes in sheets 38x38 inches, is miles ahead of every other known substance for paneling and insulating radio installations, and can be readily machined by any decently-equipped machine-shop. The difficulty the machinist will have will be in taking care promptly of the orders that will be forced upon him; and that, though it sounds almost too good to be true, is absolutely a FACT. The free book tells all about it, giving every fact the machine-shop man wants to know; and there is not one cent to pay for a copy of it, if you are legitimately a machinist with a plant fit for ordinary work. Send for your copy today, ride the wave of radio development to your own profit, and understand that you commit yourself to nothing whatever by asking for a copy. Ask The Continental Fibre Company, Newark, Delaware.



2 When tuned in, attach speaker to phone like this—simply itself.



3 Now a whole roomful can hear perfectly, to clarify the sound you hear perfectly.



New Radio Enjoyment —at an amazing, low price

NOW comes this new Speaker, the Master-Baldwin "Throat-type" Clarophone which means new radio enjoyment. It enables a roomful of people to hear distinctly any broadcasting that your receiving set will catch.

New in design, it is more perfect in execution, because it combines the famous Baldwin Phone with a scientific throat-like speaker.

You know the Baldwin Phone, used wherever most exacting work is done. It has been selected by the United States Bureau of Standards as the standard radio phone.

The United States commandeered the Baldwin factory during the war to assure Baldwin Phones for War Vessels, and Army and Government stations.

A Clarifier—Not an Amplifier

Now this finest phone is combined with a new scientific speaker which enables you to hear distinctly every word or note—hear the overtones, even the harmonics. No rasping, buzzing, breaking or any noise due which your receiving set is not responsible.

Designed like the human throat, the speaker has the same tone chamber. And the top part is fashioned after the roof of the mouth. Both are shaped in non-resonant metal.

It has the rectangular mouth, following the principle that opera singers know and use. For getting full resonance they always square their mouths in singing—never round them.

Unequalled Low-Priced Offers

The Master-Baldwin "Throat-type" Clarophone, Complete Described above, - - - \$22.50

The Master-Baldwin Phone - - - - - \$ 9.00

The genuine Master-Baldwin Improved Phone, manufactured by the Baldwin Radio Co., Salt Lake City, Utah.

The Master-Baldwin Head-Set - - - - - \$16.00

The standard supersensitive head-set for those who want the double phone.

Master Radio Corporation
Dept. 4011, 631 So. Spring St., Los Angeles, California

The vocal chords are represented in the Baldwin Phone by a marvelous mica disk, unaffected by heat or cold or electric currents, which is actuated in both directions by an armature tone-arm superimposed in a magnetic field.

So the Master-Baldwin "Throat-type" Clarophone follows accurately the most perfect model ever made. To hear one is to want one.

Why We Can Sell It For \$22.50

Because of its simple but scientific design the Clarophone lends itself to large quantity production which enables us to sell it for \$22.50—an amazing price.

And the Master-Baldwin "Throat-type" Clarophone is the world's standard quality—remember the Government selection of Baldwin Phones.

Try It at Our Risk

We know that the Clarophone will please you. So we invite you to test it for ten days at our risk. If you are not pleased, your dealer will gladly refund your money.

Ask your dealer for the Master-Baldwin "Throat-type" Clarophone.

If he hasn't it, order direct from us, enclosing \$22.50. We will ship immediately, charges prepaid, a complete Clarophone to you. (Reference: Citizens National Bank, Los Angeles, Calif.)

Try the Clarophone. Know the real pleasure it will give you.

The Master-Baldwin "Throat-type" Clarophone

REG. U. S. PAT. OFF.

Master Radio Corporation,

Dept. 4011, 631 So. Spring St.
Los Angeles, California.

Enclosed is \$22.50 for one Master-Baldwin "Throat-type" Clarophone, charges prepaid, insured. My money to be returned if I am not satisfied. I buy my radio equipment from

(Dealer's Name) _____

(Address) _____

(Your Name) _____

(Address) _____

MAKE YOUR OWN RADIO SET

Prices Slashed!



VARIOMETER



VARIO COUPLER



VARIABLE CONDENSER



TRANSFORMER



VACUUM TUBE SOCKET



GRID DIAL LEAKS

Not one bit of experience is required to make your own high grade Radio Receiving Set. Our instructions are so simple that a boy of twelve can follow them easily.

Thousands of homes are enjoying daily RADIO PROGRAMS received on sets made the METRO way. You too, now have this same opportunity. You will take great pride in owning a set made by yourself, and the cost will be only a fraction of what you would have to pay for the highest type of Radio set.

Save 40% Buy Direct From the Factory

No dealers. No jobbers. The large **Metro factory** ships radio parts direct to users at a clean saving to them of 40%. Note these prices.

	Regular Price	Special Price
Variometers	\$5.00	\$3.00
Vario Couplers	.50	3.00
Transformers	5.00	3.00
23 Plate Condensers	.60	2.25
43 Plate Condensers	4.50	2.75
Vacuum Tube Sockets	1.00	.65
Dials and Knobs	1.00	.65

Every part is made right in our own factory and is carefully tested and inspected by Radio experts. Every part is guaranteed to work perfectly.

FREE—illustrated photo diagrams and prints with complete working drawings and instructions for assembling your own Radio Set—**ABSOLUTELY FREE** with every order.

Order Today! This special bargain price offer is for a limited time only. Send full payment with order, or if you prefer, you may send a deposit and we will ship C. O. D. for the balance. Circular mailed on request.

Satisfaction Guaranteed or Money Back
Write Department 2

METRO ELECTRIC CO.
1422-1438 RANDOLPH ST. CHICAGO

HOMCHARGE YOUR RADIO BATTERY for a Nickel

ENJOYABLE Radio Listening and Maximum Reception Range are obtained only when your battery is fully charged. The



charges your "A" or "B" battery over night. Simple and clean to operate—requires no watching—may be used right in your living room.

Connects to any lamp socket. Self-starting—fully automatic—cannot overcharge or injure the battery.

Entirely enclosed—approved by Underwriters. Unconditionally GUARANTEED. Lasts a lifetime.

Beautifully finished in Mahogany and Gold—the most efficient and handsome radio battery charger ever produced. Bulletin G-11, prove it—send for your copy today—it's FREE. Sold by all good dealers or shipped prepaid for \$16.00, complete.

Features—Subtleties: The HOMCHARGER Merchandising Plan affords best protection to the radio dealer—send for details.



THE AUTOMATIC
ELECTRICAL DEVICES CO.

127 West Third Street
Cincinnati, Ohio

Over 50,000 HOMCHARGERS in Use



"MAMMOTH" TUNING COIL

\$150

With Wood Mounting

A superior tuning coil for amateurs and others—8 inches in length and 4 inches in diameter—bound at both ends with polished aluminum bands. The "Mammoth" is made of heavy fibre tube, SHELLACKED (not parafined) inside and out. Wound with high quality No. 22 enameled copper wire, shellacked in place, the ends being brought through the tube and securely fastened. The "Mammoth" is the ideal tuning coil for sets designed to receive telephone messages and music within 40-mile radius. Mounting is made of three-ply veneer—will not warp. Sent postpaid to any address at the special introductory price of \$1.50, currency or money order. Call alone, \$1.00. Send today and take advantage of this special introductory offer. Agents and dealers wanted.

Oakwood Radio Co.

Dept. 10, Detroit, Mich.



Save Money

Build Your Own At Home
Complete Standard Parts for Long Distance Radio Outfits. We do all machine work; you do the hand work; we tell you how. Immediate delivery. Also complete Radio Sets—all sizes at bargain prices. Write now for our big bargain catalog.

4739 Calumet Avenue

Dept. 10 Chicago, Ill.

Colonial Radio Equipment Co.

Now four can listen to clear
RADIO MUSIC

With the Frost-Radio Multiphone plug (shown to right) four Frost-Poets can be attached to Radio Receiving Set.

Your local Radio dealer can supply you. See him. Now!

No. 138 \$2.50



Frost standard jack
Packed in individual container

HERBERT H. FROST 154 W. Lake St.
Chicago, Ill.



They Fight Film—

They who have pretty teeth

Note how many pretty teeth are seen everywhere today. Millions are using a new method of teeth cleaning. They remove the dingy film. The same results will come to you if you make this ten-day test.

Why teeth are cloudy

Your teeth are coated with a viscous film. It clings to teeth, gets between the teeth and stays. Film absorbs stains, then it often forms the basis of thin, dingy coats. Tartar is based on film.

Old brushing methods do not effectively combat it. So

most teeth are discolored more or less.

Thus film destroys tooth beauty. It also causes most tooth troubles. It holds food substance which ferments and forms acid. It holds the acid in contact with the teeth to cause decay.

Germs breed by millions in it. They, with tartar, are the chief cause of pyorrhea, now so alarmingly common.

Now a daily remover

Dental science, after long research, has found two ways to combat film. Authorities

have proved their efficiency. Now leading dentists, nearly all the world over, are urging their daily use.

A new-type tooth paste has been created to comply with modern requirements. These two film combatants are embodied in it. The name of that tooth paste is Pepsodent.

Its unique effects

Pepsodent, with every use, attacks the film on teeth.

It also multiplies the starch digestant in the saliva. That to digest the starch deposits which may cling to teeth and form acids.

It multiplies the alkalinity of the saliva. That is Nature's neutralizer for the acids which cause decay.

In these three ways it fights the enemies of teeth as nothing else has done.

One week will show

Watch these effects for a few days. Send the coupon for a 10-Day Tube. Note how clean the teeth feel after using. Mark the absence of the viscous film. See how teeth whiten as the film-coats disappear. Enjoy the refreshing after-effects.

Do this to learn what millions know—the way to whiter, cleaner, safer teeth. Cut out the coupon now.

Pepsodent
PAT. OFF.
REG. U. S.

The New-Day Dentifrice

Endorsed by modern authorities and now advised by leading dentists almost the world over. Used by careful people of some forty races. All druggists supply the large tubes.

10-Day Tube Free

THE PEPSODENT COMPANY,
Dept. 358, 1184 S. Wabash Ave., Chicago, Ill.
Mail 10-Day Tube of Pepsodent to

.....
.....
.....
Only one tube to a family.



Pit Head Gear



Jib Crane



Gantry Crane



He
didn't
buy
it;
he
BUILT
IT!

for Christmas— **MECCANO**

ENGINEERING FOR BOYS

The reason why you can build such wonderful models with Meccano is that every part is a real engineering piece—pulleys, gears, strips, girders, rods, couplings and cranks, all perfectly designed and accurately made.

ANYWHERE BETWEEN 5 AND 70 is the correct age to start Meccano. The youngest boy can begin to build the moment he gets his outfit home. A screw driver and spanner are the only tools necessary. Every outfit complete, nothing further to buy.

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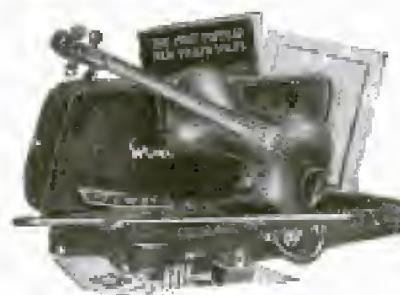
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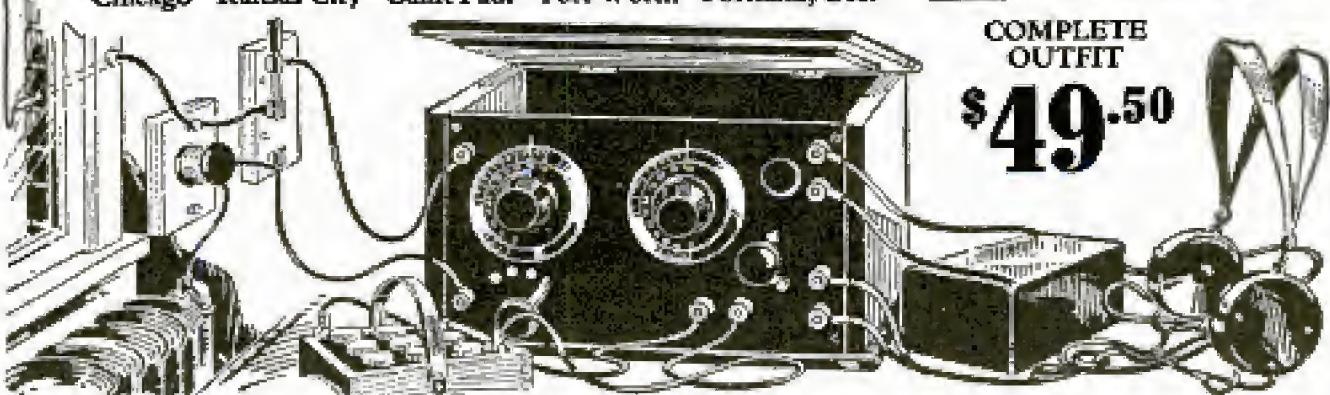
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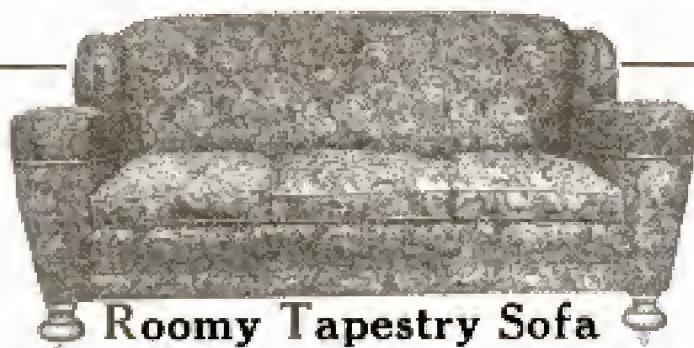
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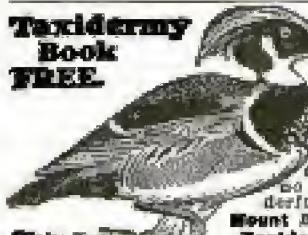
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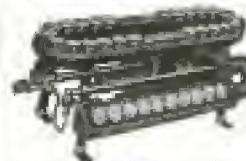
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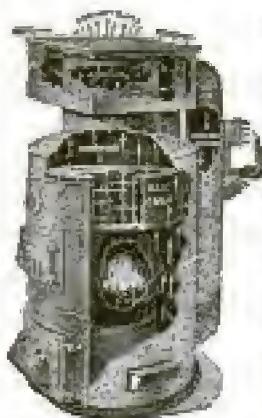
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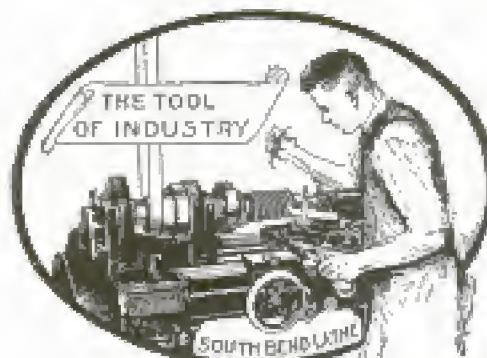
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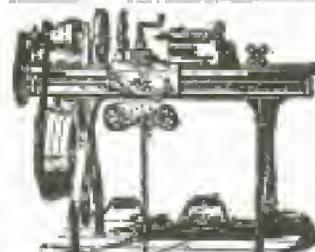
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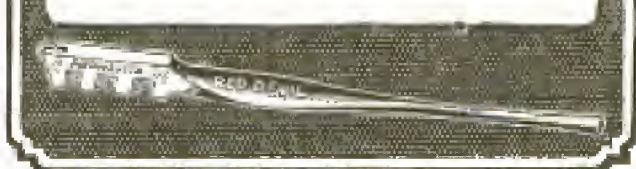
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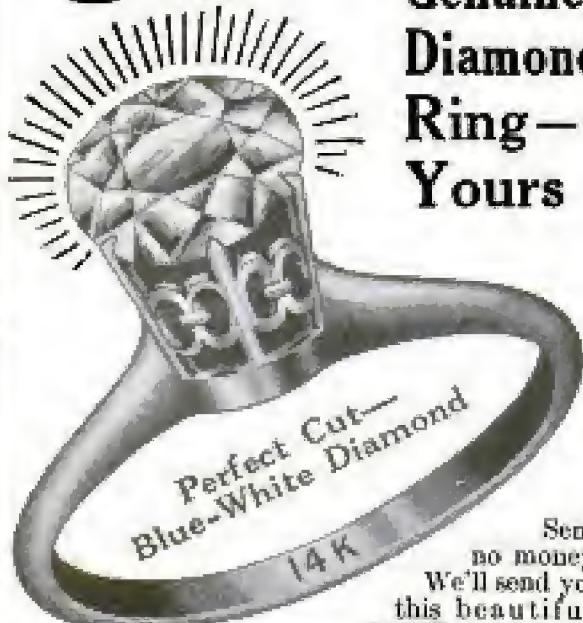
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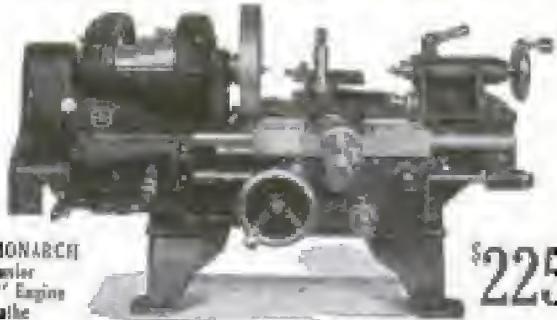


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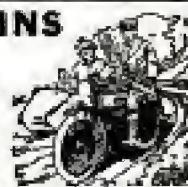


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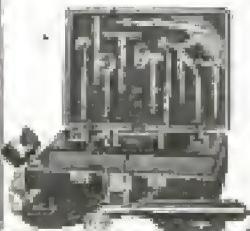
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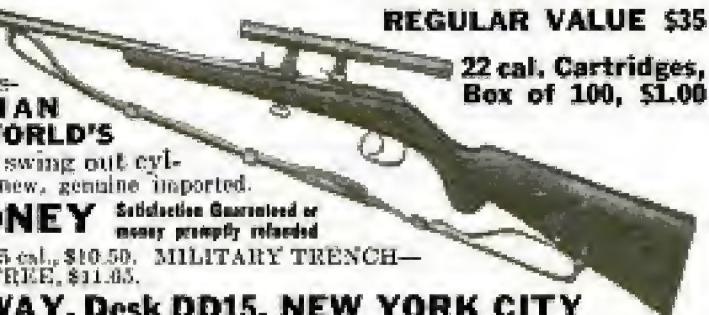
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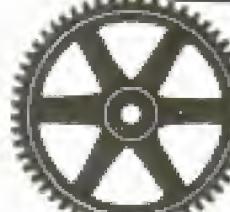
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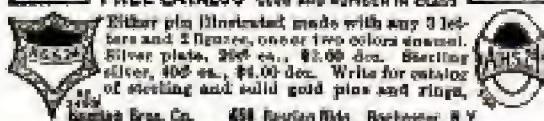
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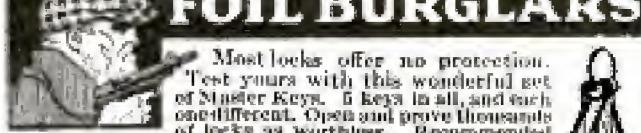
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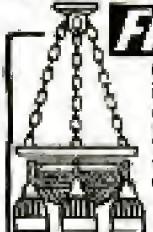
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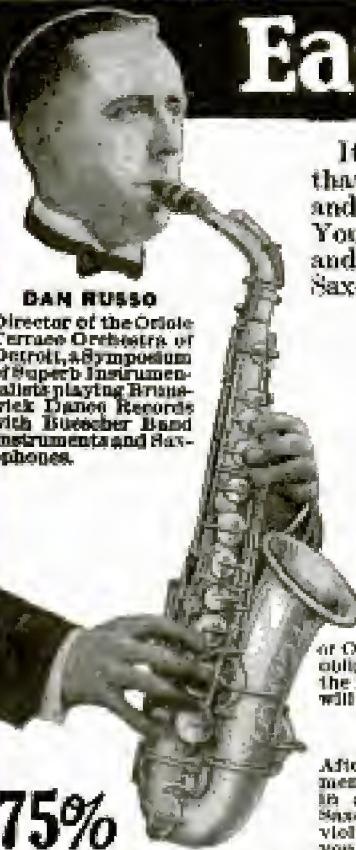
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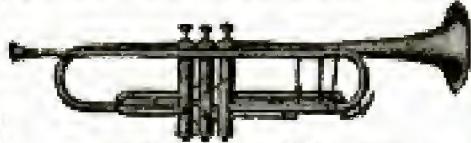
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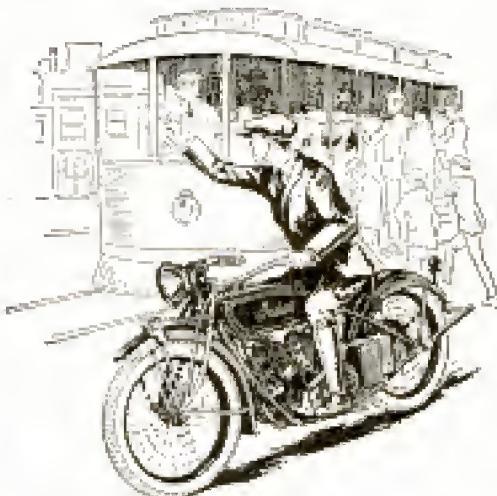
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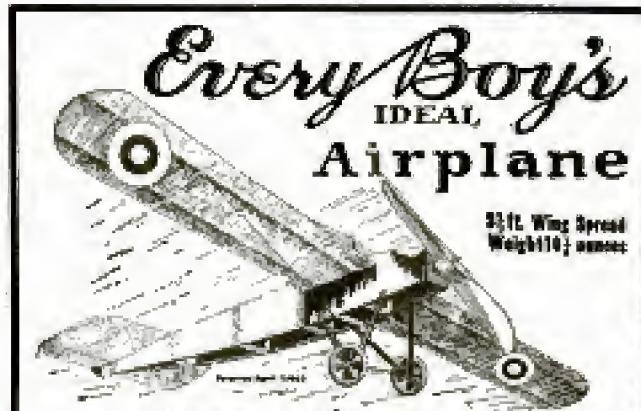
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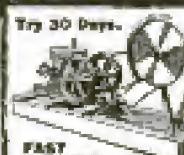
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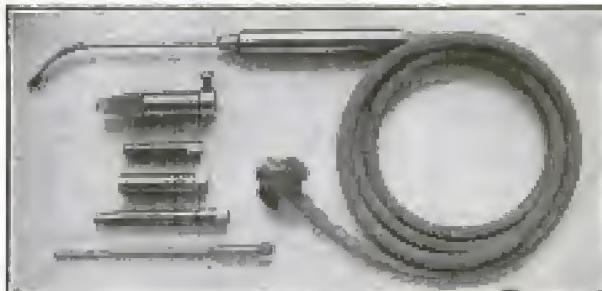
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uniform depth—and made twice
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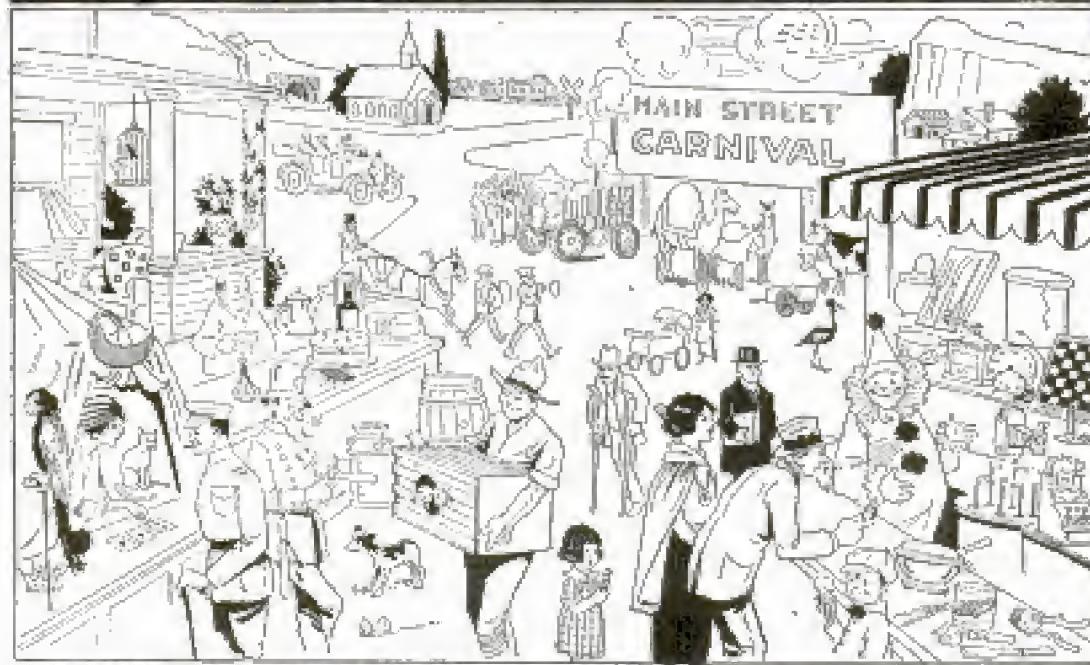
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3rd Prize	350.00
4th Prize	200.00
5th Prize	100.00
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5th Prize	5.00
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To Solve Puzzle Name Only Those Objects In Picture Beginning With Letter "C"

ANSWER THIS PUZZLE PICTURE

Want to win \$1,000—QUICKLY? Look at the picture above. They're all plain, every day objects, aren't they? Make a list of the names of only those beginning with "C"—like cage, cat, child, etc., and send it in. Yours may be the best answer and win the biggest prize. Correct list by which judging will be done will be made up only of correct words included in all lists received. Thus you are insured honest and impartial treatment. Our policy guarantees A SQUARE DEAL FOR ALL!

How to Win \$1,000

Two \$1,000 cash prizes are offered for first and second best puzzle answers. So if your list of words is awarded first or second prize and you have "Qualified" for Class "A" by ordering only one Drew Jewel-point Fountain Pen, at the special introductory price of \$5, you will win \$1,000. But if you have not ordered a pen you would win only \$25.

MEMO BOOKS FREE

Everyone sending in a puzzle answer that merits the consideration of the Judges will receive absolutely free our unique memo book with 1921 calendar. It's a handy little booklet for addresses, birthdays, etc., so send in a good list at once.

SQUARE DEAL RULES

1. Anyone living outside of St. Paul may take part in this puzzle game except employees of this company or their relatives.

2. Names of those objects visible in picture beginning with letter "C". Whichever list receives the most points will be awarded first prize, and so on down the list of 50 prizes. One point will be given for each correct word, and one deducted for each incorrect word or omission of a correct word. In case of tie, points tied for will be awarded such tying contestants. The correct list by which judging will be done will be made up from lists received, and not from any so-called "master list." List containing first prize and names and addresses of all prize winners will be published at close of contest and passed to all who have "Qualified" for Class "A."

3. Use only English words. An object may be named only once, but parts of objects may also be named. Rather than attempt to pluralize a word, just repeat, but not both. Words of the same spelling but different meaning or synonymous words will count only once. Compound, hyphenated and absolute words are not permissible. Webster's International Dictionary will be the final authority.

4. Write your name on one side of paper only, number each word 1, 2, 3, 4, etc., and be sure to write your full name and address at top of each sheet. All entries must be mailed and postmarked not later than December 2, 1920. Contingencies may "Qualify" for Class "A" up to midday December 16, 1920.

5. Three prominent St. Paul people have consented to act as Judges: Dr. M. N. Moen, Jewel-Tipped Public School Teacher; and P. M. Beagan, President Walker National Bank. All who take part in contest agree to accept their decisions as final and conclusive.

6. Enlarged Picture Free On Request.



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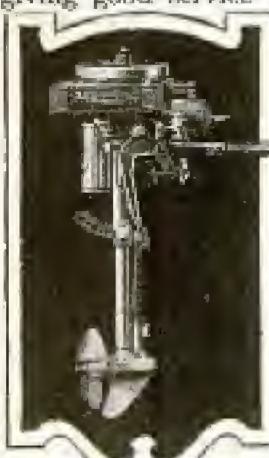
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| <input type="checkbox"/> Accountancy (including C.P.A.) | <input type="checkbox"/> Civil Service |
| <input type="checkbox"/> Merchandise Cost Accounting | <input type="checkbox"/> Railway Mail Clerk |
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| <input type="checkbox"/> Private Secretary | <input type="checkbox"/> High School Subjects |
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| <input type="checkbox"/> French | <input type="checkbox"/> Cartooning |

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| <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> Contracting and Building |
| <input type="checkbox"/> Mechanical Draftsmen | <input type="checkbox"/> Architectural Draughtsmen |
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| <input type="checkbox"/> Railroad Positions | <input type="checkbox"/> Structural Engineer |
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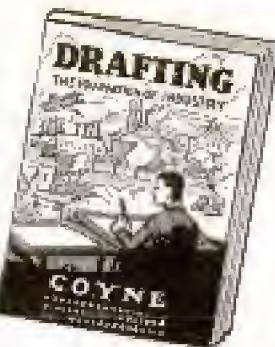
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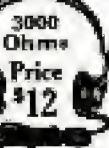
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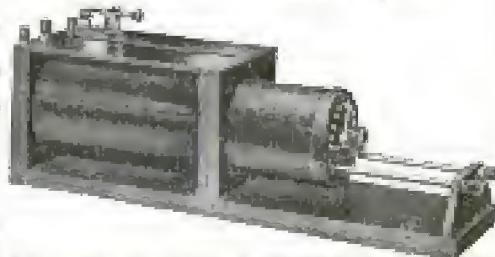
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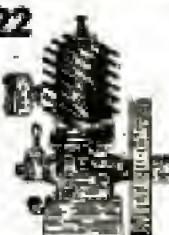
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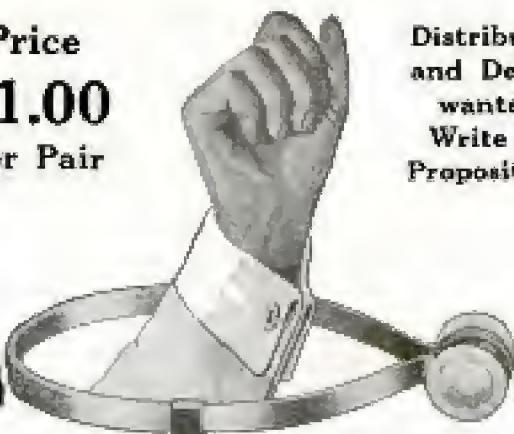
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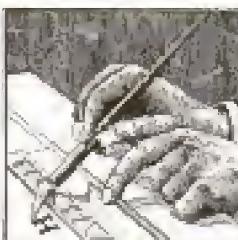
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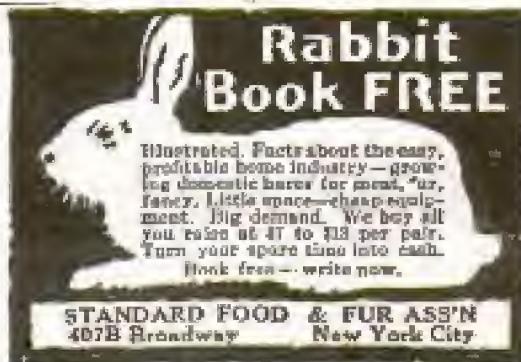
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12x6	6.95	12.95	18.95	24.95	30.95	36.95	42.95	48.95
12x7	7.75	14.95	21.95	28.95	35.95	42.95	49.95	56.95
12x8	8.75	16.95	24.95	32.95	40.95	48.95	56.95	64.95
12x9	9.75	18.95	27.95	36.95	45.95	54.95	63.95	72.95
12x10	10.95	20.95	30.95	40.95	50.95	60.95	70.95	80.95
12x11	12.95	24.95	36.95	48.95	60.95	72.95	84.95	96.95
12x12	14.95	27.95	40.95	53.95	66.95	79.95	92.95	105.95
12x13	16.95	30.95	45.95	60.95	76.95	92.95	108.95	125.95
12x14	18.95	33.95	50.95	67.95	85.95	104.95	123.95	142.95
12x15	20.95	36.95	54.95	72.95	91.95	111.95	132.95	152.95
12x16	22.95	39.95	58.95	77.95	96.95	116.95	136.95	156.95
12x17	24.95	42.95	61.95	81.95	101.95	121.95	141.95	161.95
12x18	26.95	45.95	65.95	85.95	105.95	125.95	145.95	165.95
12x19	28.95	48.95	68.95	88.95	108.95	128.95	148.95	168.95
12x20	30.95	51.95	71.95	91.95	111.95	131.95	151.95	171.95
12x21	32.95	54.95	74.95	94.95	114.95	134.95	154.95	174.95
12x22	34.95	57.95	77.95	97.95	117.95	137.95	157.95	177.95
12x23	36.95	60.95	80.95	100.95	120.95	140.95	160.95	180.95
12x24	38.95	63.95	83.95	103.95	123.95	143.95	163.95	183.95
12x25	40.95	66.95	86.95	106.95	126.95	146.95	166.95	186.95
12x26	42.95	69.95	90.95	110.95	130.95	150.95	170.95	190.95
12x27	44.95	72.95	93.95	113.95	133.95	153.95	173.95	193.95
12x28	46.95	75.95	96.95	116.95	136.95	156.95	176.95	196.95
12x29	48.95	78.95	100.95	120.95	140.95	160.95	180.95	200.95
12x30	50.95	81.95	103.95	123.95	143.95	163.95	183.95	203.95
12x31	52.95	84.95	106.95	126.95	146.95	166.95	186.95	206.95
12x32	54.95	87.95	109.95	129.95	149.95	169.95	189.95	209.95
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12x34	58.95	93.95	115.95	135.95	155.95	175.95	195.95	215.95
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12x44	78.95	123.95	145.95	165.95	185.95	205.95	225.95	245.95
12x45	80.95	126.95	148.95	168.95	188.95	208.95	228.95	248.95
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12x51	92.95	144.95	166.95	186.95	204.95	224.95	244.95	264.95
12x52	94.95	147.95	169.95	189.95	207.95	227.95	247.95	267.95
12x53	96.95	150.95	172.95	192.95	210.95	230.95	250.95	270.95
12x54	98.95	153.95	175.95	195.95	213.95	233.95	253.95	273.95
12x55	100.95	156.95	178.95	198.95	216.95	236.95	256.95	276.95
12x56	102.95	159.95	181.95	201.95	219.95	239.95	259.95	279.95
12x57	104.95	162.95	184.95	204.95	222.95	242.95	262.95	282.95
12x58	106.95	165.95	187.95	207.95	225.95	245.95	265.95	285.95
12x59	108.95	168.95	190.95	210.95	228.95	248.95	268.95	288.95
12x60	110.95	171.95	193.95	213.95	231.95	251.95	271.95	291.95
12x61	112.95	174.95	196.95	216.95	234.95	254.95	274.95	294.95
12x62	114.95	177.95	199.95	219.95	237.95	257.95	277.95	297.95
12x63	116.95	180.95	202.95	222.95	240.95	260.95	280.95	290.95
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12x65	120.95	186.95	208.95	228.95	246.95	266.95	286.95	296.95
12x66	122.95	189.95	211.95	231.95	250.95	270.95	290.95	299.95
12x67	124.95	192.95	214.95	234.95	253.95	273.95	293.95	299.95
12x68	126.95	195.95	217.95	237.95	256.95	276.95	296.95	299.95
12x69	128.95	198.95	220.95	240.95	260.95	280.95	299.95	299.95
12x70	130.95	201.95	223.95	243.95	263.95	283.95	299.95	299.95
12x71	132.95	204.95	226.95	246.95	266.95	286.95	299.95	299.95
12x72	134.95	207.95	229.95	250.95	270.95	290.95	299.95	299.95
12x73	136.95	210.95	232.95	253.95	273.95	293.95	299.95	299.95
12x74	138.95	213.95	235.95	256.95	276.95	296.95	299.95	299.95
12x75	140.95	216.95	238.95	260.95	280.95	299.95	299.95	299.95
12x76	142.95	219.95	241.95	263.95	283.95	299.95	299.95	299.95
12x77	144.95	222.95	244.95	266.95	286.95	299.95	299.95	299.95
12x78	146.95	225.95	247.95	269.95	289.95	299.95	299.95	299.95
12x79	148.95	228.95	250.95	270.95	290.95	299.95	299.95	299.95
12x80	150.95	231.95	253.95	273.95	293.95	299.95	299.95	299.95
12x81	152.95	234.95	256.95	276.95	296.95	299.95	299.95	299.95
12x82	154.95	237.95	259.95	280.95	299.95	299.95	299.95	299.95
12x83	156.95	240.95	262.95	283.95	299.95	299.95	299.95	299.95
12x84	158.95	243.95	265.95	286.95	299.95	299.95	299.95	299.95
12x85	160.95	246.95	268.95	290.95	299.95	299.95	299.95	299.95
12x86	162.95	249.95	271.95	293.95	299.95	299.95	299.95	299.95
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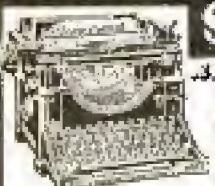
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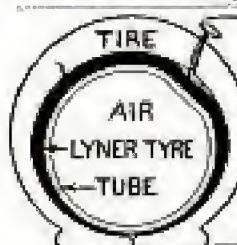
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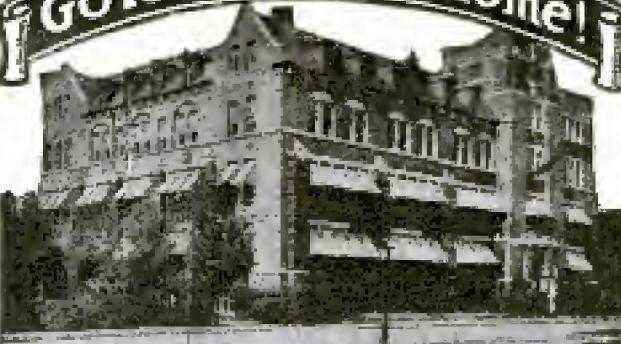
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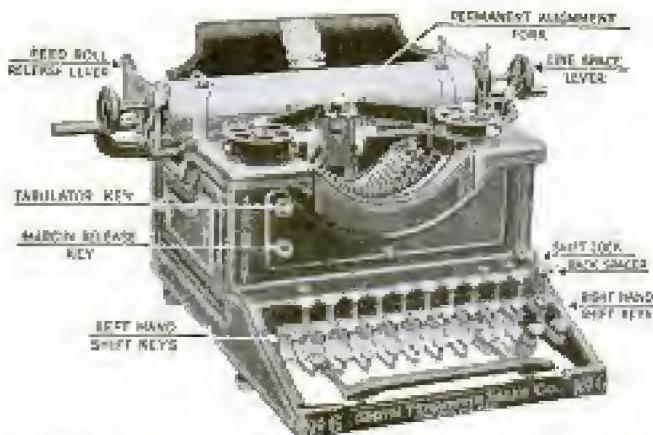
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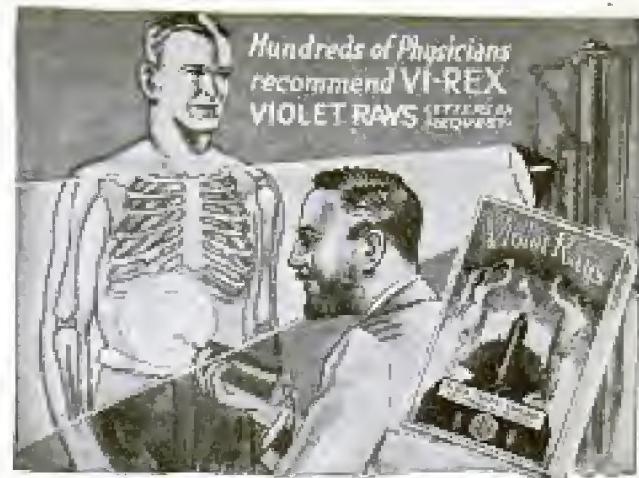
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**Portable and Easy to Operate. Use engine
also to pump, grind, buzz wood, or do other
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**Only Log Saw Sold On LIFETIME
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See What You Get—Special 4-cycle Log Saw
Engine—More power than
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If that is the kind of a rig you want, write us. CATALOG FREE.

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New uncreased floor. Contractors prefer to submit their applications to American Universal Contractors. Machines does work of it
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Prepare for big building boom. Make new floors perfect, old
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Are Your Hands Tied?

Are your hands tied by a lack of training? Are you bound down to a routine job because you have never learned to do any one thing well?

Don't give up! There is an easy, fascinating way for you to prepare yourself for a better job and a bigger salary. You can do it right at home in the spare time that now goes to waste.

No matter where you live, the International Correspondence Schools will come to you. No matter what your handicaps, or how small your means, we have a plan to meet your circumstances.

Don't let another priceless hour of spare time go to waste. Without cost or obligation, let us prove that we can help you to get a better job and a bigger salary. Just mark and mail this coupon.

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Without cost or obligation, please tell me how I can qualify for the position or in the subject before which I have marked an X.

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City..... State.....

Occupation.....

Persons residing in Canada should send this coupon to the International Correspondence Schools, Limited, Montreal, Canada.

Please mention Popular Mechanics



\$70 to \$90 Daily

FLESSNER Brothers have hit their stride. Under date of Aug. 29, 1922, they say: "Did \$300 last week. Have averaged this amount during the past few weeks. Some days we take in \$70, \$80 and \$90." Others coining money too. Ira Shook's place regular magnet. On holidays receipts run high as \$375. My CRISPETTE machine does the trick! Makes those wonderfully delicious, toothsome confections that sell right and left.

Big Money in Crispettes

Money—lots of it—for those who start the CRISPETTE business. Gibbs writes: "Sold \$50 first night." Master's letter says; "Sold \$40 in one hour." Erwin's boy (going to school) makes \$35 every Saturday afternoon.

I Start You in Business

I furnish everything—secret formula, equipment, supplies, etc. Experience not necessary. It's a project you can handle. Amazing successes everywhere—cities, small towns, and so on. CRISPETTE habit grows and sticks wherever introduced.

\$1,000 Month Easily Possible

You are successful from the very start. No slow building-up process. Business grows by leaps and bounds. Some men wholesale to stores, others do direct retail business. All reap wonderful financial harvest. Raw materials plentiful and cheap. Profits enormous. Do not do another thing until you have clipped and mailed coupon.

LONG EAKINS CO.

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Rejuvenate your Energies

Attain the vigor and power you are entitled to.

SHELTON VIOLET RAY—this wonderful new scientific discovery—will give you the means of alleviating all your ailments by the simple application of soothing, satisfying electric waves.

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SEND NO MONEY

On delivery, pay the postman Only \$12.50, and at the end of thirty days, when you have proven to your own satisfaction that the

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Send today for the genuine Violet Ray—the **SHELTON Laboratory Model**.

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Factory Sale



Copper Oil Kettles

All made of 16, 18, 20 and 22 gauge best cold rolled heavy solid copper. Non-explosive. All solder outside. 6 inch air-tight screw cap. Absolutely guaranteed to be the best and strongest kettle made.

Goods shipped the day order is received. Packed to strength, plain boxes. Above are lowest factory cash price. Send money order or draft with order.

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Reference: Commercial Bank, Chicago, Ill.

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**50¢
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Send only 50¢ with coupon for this coat. Guaranteed rain proof, and is also suitable for stylish top coat. Made from moleskin cloth, a smooth, soft-finished material resembling chamois leather. Warm and comfortable in the coldest weather. Double-breasted belted style with stylish plaited pockets. Strap on sleeve. Yoke back with inverted plait, giving the coat plenty of fullness. Collar can be converted into military style buttoning close up to neck. Backed with fancy plaid fast colored woven lining. All seams sewed, strapped and cemented. 45 inches long. Sizes 34 to 46. Rich Leather Brown Shade. Order by No. F-19. Terms, 50¢ with coupon, \$2.25 monthly. Total price, \$13.85.

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Buy the Elmer Richards way. You can always be well dressed and pay in small monthly sums, so small you will never miss the expense. Money back if not satisfied. No charge for credit. Don't miss this bargain. Supply limited at this special bargain price.

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Enclose 50¢, Send Moleskin Cloth Coat No. F-19. Size
If I am not satisfied when I receive the coat I can return it and get my payment back with charges. Otherwise, I will pay advertised terms, 50¢ with coupon, \$2.25 monthly. Total price, \$13.85.

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Address
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P. O. State

\$20.00 Value
Special Price
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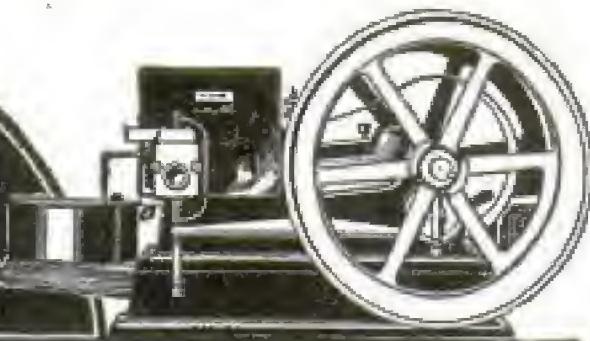
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2 H.P. Chas. Beaulieu, W.L., says: "Good as the first day I had it."

3 H.P. M. W. Kopecky, Tex.: "Easy to start—stop—regulate."

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12 H.P. A. R. Trest, smooth as a sewing machine."

16 H.P. J. C. Clark, Va.: "I like the 16 H.P. fine."

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Engine Value Depends On EASY OPERATION, LOW FUEL COST and DURABILITY

Records for 37 years show that WITTE Engines not only stand up, giving long service, but they have big surplus power, operate easy, cost less to operate, and sell for less. No matter what size engine or power outfit you need or where you live, I can supply you direct at a saving—make Immediate Shipment—Cash or Easy Terms, as you wish—in sizes 2 to 30 H.P.—most any style you want.

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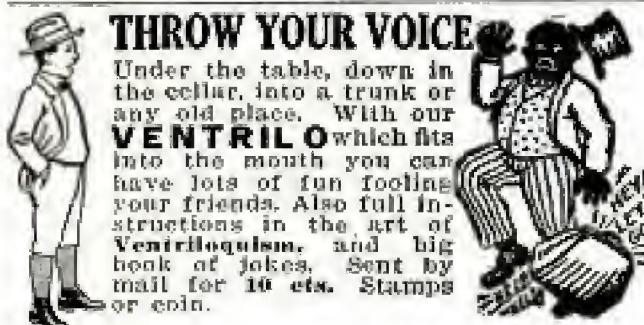
This guarantee applies to every size and style outfit I make—Stationary, Portable, Portable Buzz Saw, Log Saw, Tree Saw, Stationary Cutoff Saws, Power Stump Borers and my New "Power-Lite" Engine used on electric light plant. I furnish this new light plant complete, with engine, generator and batteries ready to attach to your wiring, at a big saving in price. Use it for both power and light. If you need power for any purpose—write to WITTE—get an engine you know is time-proven, reliable and durable. Read what users say.

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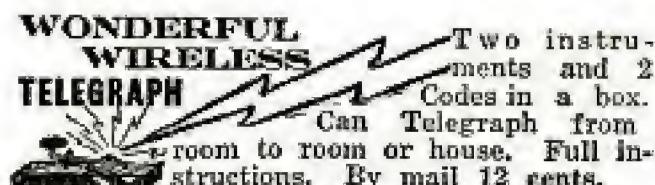
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6 15 18 4 Solve This Puzzle—Win 5,000 Votes

9 19 6 18 5 5 What words do these numbers make?

The numbers in the squares represent letters of the alphabet. Picture 1 has 2 'A's and 2 'B's. The last figures spell three words. What are the words?

Many Prizes and Cash Rewards Get your share of these EASY-TO-WIN prizes. Besides the Ford Touring Car, we are going to give Photographs, Pictures, Gold Watches, Silverware, etc., and Cash Prizes to contestants in my contest for

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UP IT GOES!

Climb in the air by its own power. The propeller spinning automatically at a lively rate.

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Letters written with this ink look like blank paper. Can be brought out plainly by heating over lamp or stove. Bottle in wooden box, 10 cents.

SKULL RING



The eyes in this ring are either Emeralds or Rubies and would scare the timid. Either Human Gold or Oxidized Silver. 25c by mail.



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BE A Taxidermist. Learn at home by mail to mount all kinds of specimens absolutely true to life. Save the trophies of wonderful beauty and value that you secure on your hunting and outing trips. Mount them yourself. Save Taxidermist bills, decorate your home, den or office with the choicest art in all the world. Instead of pictures of game for your dining room have actual mounted trophies. Nothing like it! Thousands now learning from our splendid mail lessons. You can learn, too. Here is a real wonderful opportunity. Do not neglect it. **Send the coupon today for free books and full particulars.** You positively learn to

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You can learn to mount game-heads, fishes, reptiles; to tan skins and make magnificent traps and robes. You enjoy every moment given to Taxidermy. You can learn easily and quickly at home by mail. Attracted to everyone, men, women and boys. Learned in spare time only. Enroll in our school and be a real Taxidermist. This is the one and original school, teaching the intent and easiest methods. Over 55,000 graduates. Among our students are the most famous sportsmen, gun-doctor, lawyers, statesmen, lawyers, doctors, merchants, farmers and mechanics. If you ever hunt or fish, or if you are a bird or nature lover, don't overlook this marvelous opportunity.

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No other art is so interesting and fascinating. Men and women make Taxidermy a hobby. Nothing equals it for a delightful sparetime occupation. If you want to make big profits from your leisure time, taxidermy is just the thing. One student easily earns from \$50 to \$500 a week from spare time alone, mounting trophies for sportsmen, and selling their own mounted game specimens. Professional taxidermists can earn \$3,000 to \$5,000 a year. You will be delighted with this marvelous art, so investigate now. Write for our free books, and see for yourself what a wonderful art Taxidermy really is.

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Grover Whited, the great National League ball player (Philadelphia team): "I am delighted with your course of lessons. I heartily recommend them."

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Send the coupon today, right now, before you forget it. The coupon will bring you, absolutely free, a magnificent taxidermy book, finely illustrated with photos of game specimens, also a copy of the *Taxidermy Magazine*. Remember these are FREE, no obligations whatever. Mail the coupon or a postal will do. These free books will show you marvels you never dreamed of in the new and easily learned art of taxidermy.

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Our school is patronized by Paul J. Rainey, the greatest living sportsman, by the Rockefellers, U. S. Govt., State Universities, Museums and Colleges.

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Without obligation on my part send me copies of your *Free Taxidermy Book* and the *Taxidermy Magazine*, and full particulars about your course of lessons on taxidermy.

Name _____

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Let Me Pay You \$12 for 15 Minutes of Your Time

\$215 in One Day

"Ye gods—some seller! I made \$215 today!"

F. W. Bentley, Philadelphia.

Buys Car With Profits

"Have earned enough in one month to buy me a new auto."

A. W. Kappan, Cal.

\$7 Profit per Hour

"I started out and made \$21.50 in about 3 hours. The Oliver does the work. It certainly is the real thing."

L. Zucker, Ohio.

Sells Like Beer In a Dry Town

"Am sending today for 7 Olivers. This is one day's orders (\$80 profit). Selling like beer in a dry town."

W. H. Drew, Mich.

Mr. T's 28th Order in Six Months

"Ship 50 Olivers; 10 No. 30; 9 No. 1; 12 No. 2; 24 No. 4. (Mr. T's profit on this order alone is \$711.)"

G. T., Ottawa, Ont.

Russel Earned \$3,300 in Five Months

"Have averaged \$500 profit 4 months for last six months."

A. M. Russel, Conn.

Carnegy— \$1,000 a Month

"Am making \$1000 per month. I have made big money before, but did not expect so much. Your Burner is just the thing."

J. Carnegie, S. D.

Burger— \$258.50 per week

"Send following weekly hereafter: 10 No. 1; 8 No. 2; 4 No. 5."

H. Burger, Ont.

\$11.75 in Ten Minutes

"I took order for a neighbor. \$11.75 profit in ten minutes."

Mrs. N. B., Hattiesburg, Miss.

\$43 in One Evening

"I made \$43 last night selling Oliver burners."

N. B. Chelan, Wash.

Oliver Oil-Gas Burner and Machine Co.

2014-W Pine Street, St. Louis, Mo.

Please send me full facts about how I can make at least \$5,000 a year representing you in my territory. Also your plan if I wish to make big money in my spare time.

Name.....

Address.....



B. M. OLIVER

The man who built the Oliver and largest Manufacturing Corporation Oil-Gas Burners in the World. Write now to have us show you how to make \$12 for 15 minutes of your time! Read what he has done for others right on this page.

New Invention Is Sweeping Salesmen Into Big Profits

AGENTS find it no work at all to sell this amazing invention—the Oliver new Improved Oil-Gas Burner. They just show it—taking only one minute to connect it—then light it. And the sale is made! This new invention is its own salesman. It sells itself! About 15 minutes does it. The Oliver Oil-Gas Burner is the most timely thing that could be put out. It dispenses entirely with coal and wood when both are now high-priced. It burns the cheapest fuel—oil. It saves a woman work now in times when she is looking for just such things. Just as much or as little heat as wanted, oil and on instantly by simply turning a valve. It makes an immediate hit with her. Because in the winter it gives her a third the heat of any other method. And in the summer she has heat for her rock stove or range whenever she wants it—but does not have to have a hot, smoking kitchen.

The Secret of Big Money —Any Season of the Year

Of course, now that you know the facts you yourself can understand why this new invention is going over like wildfire! And you can understand why F. W. Bentley made \$215 in one day. Why J. Carnegie made \$1,000 in one month and why hundreds of other agents are cleaning up big time.

These men know the secret of big money. They know a good thing when they see it and they know that the time is ripe for this new Oliver Improved Oil-Gas Burner. They know that this app of high-priced coal and wood makes it necessary the some substitute. They see stoves and locomotives being run by oil and big buildings being heated by

YES, \$12 for 15 minutes of your time. This wonderful invention practically sells itself. Just this little short-time demonstration puts the sale over for you. And you pocket the big profit. Read how easily others are drawing down enormous earnings.

No wonder this amazing new invention is bringing fortunes to agents. All over the whole country this new device is doing away with old-fashioned methods of heating with coal stoves, ranges and furnaces. Already over \$1,000,000 worth have been sold. You can readily understand why this new invention—the Oliver Perfected Oil-Gas Burner—is sweeping over the country like wildfire. It does away with all the expense of coal—making every stove a modern oil-gas burner. Saves money, time and drudgery. Three times the heat of any other method—right on tap when the housewife wants it. No hot kitchen for housewives in the summer when they don't want it. No wonder agents are riding in on the tide of big Oliver profits.

It... And they know that an invention that makes use of this cheap fuel for every house—and yet does it so as to give more heat than coal or wood—is the thing they want to be up to.

Big Profits Quickly Made

You too can use this secret of big money. You do not need to be a high-powered salesman. The Oliver's amazing features sell for you. When people see it they know at once that it is the thing they want. You will realize that this is a proposition that will pay you as big money as it does others. We have a definite number of open territories which we are ready to dispose of to those who act quickly. Every territory allotted is filled with big-money opportunities. And this big money comes easily. Because not only does this invention practically sell itself on sight but when you have sold one this one will sell several others as soon as your customer's friends and neighbors see it. And that our special plan you get credit and commissions for every sale in your territory.

You can also make big money just by using your spare time. Note how N. B. Chelan made \$43 in one evening.

Coupon Brings Full Offer

If you want to make at least \$5,000 a year easily, mail this coupon now for our offer. We are not making any extravagant claims about this. We do not have to. We believe that your common sense will indicate a good proposition to you when you know about it. We want to give you the facts. Won't you write us? And by doing so quickly you will be allotted an exclusive territory with private selling rights.

The coupon will bring you the facts and will save you writing a letter. Just mail the coupon at once.

**OLIVER OIL-GAS BURNER
AND MACHINE CO.**

2014-W Pine Street, St. Louis, Mo.



Start the Joy Special On Your LIONEL Electric Railroad



Lionel Electric Warning Signal is all-steel construction with heavily nickleated brass. Bell rings when train passes over special section of track provided with it.



Lionel "Multivolt" Transformers operate all trains from any electric light socket at minimum cost. Approved by National Board of Fire Underwriters. Best for running every electrical toy.

START your Lionel Limited with a touch of your finger on the controller. Send her down the track, fast or slow, backward or forward, stopping at stations, slowing down for signals, ringing automatic crossing warnings—golly, what a pack of fun!

Lionel locomotive and car bodies are of all-steel construction, hand-enameled, and baked like automobile bodies. For twenty-two years Lionel products have been "Standard of the World" because of their perfect electrical and mechanical workmanship.

You can run Lionel trains from any electric light socket with Lionel "Multivolt" Transformers or from dry or storage batteries.

Lionel Electric Trains are made in America and sold by department, toy, sporting goods, hardware, and electric stores. Say "Lionel" to your dealer.

Send post card at once for the handsome 40-page Lionel Catalog. The complete line is shown in beautiful four-color illustrations—chock-full of outfitts and all kinds of up-to-date railroad accessories.

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52-C East 21st Street New York City

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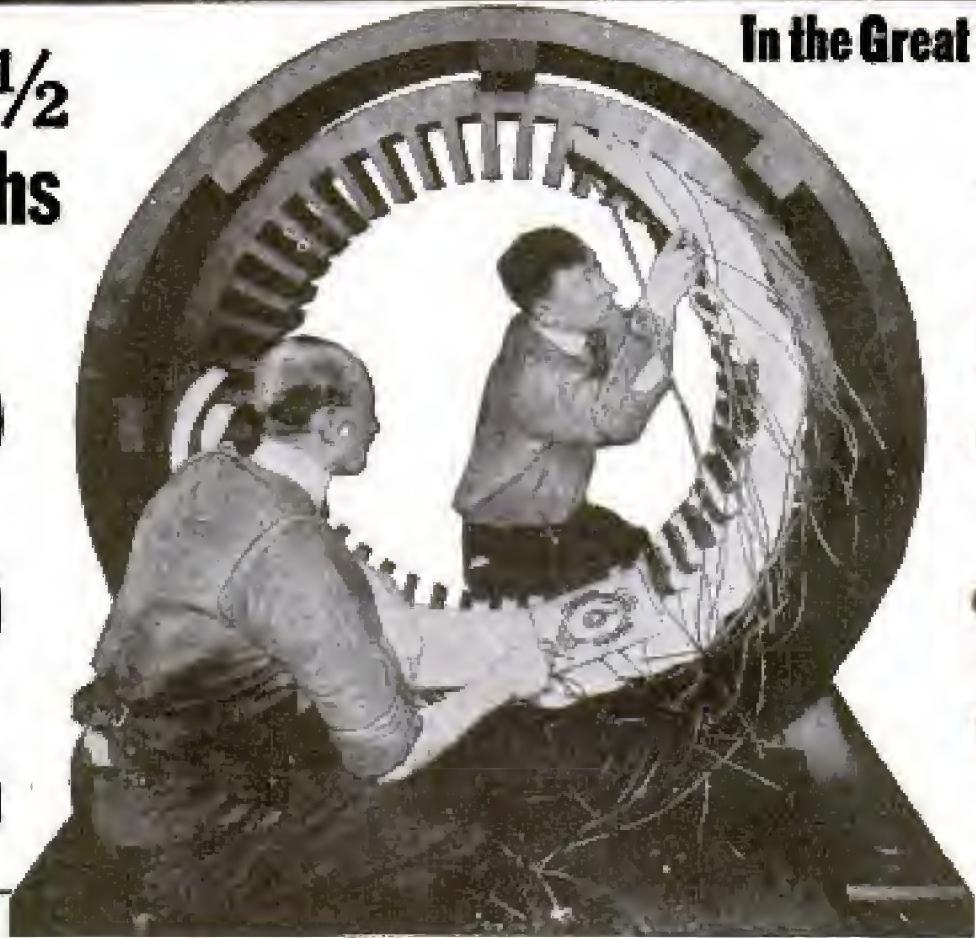
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THE whole world of electricity is open to the Coyne trained man. He is trained completely. He can make big money as Power Plant Operator, Superintendent, Telephone man, Construction worker, auto, truck or tractor electrician, battery man, radio expert, or he can go into business himself as electrical contractor, dealer, auto ignition or battery expert and make from \$1,000 to \$20,000 a year. Hundreds of our graduates today are making big money and you can do the same if you grasp this opportunity—act now.

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No books or useless theory. You are trained on \$100,000 worth of electrical equipment. Everything from door bells to power plants. Top work on motors, generators, house-wiring, autos, batteries, radio, switchboards, power plants—everything to make you an expert ready to step right into a position paying from \$45 to \$100 a week. Learn electricity in the electrical center of the world. Send the coupon today for free catalog.

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We include the following free with the regular course:

- (1) A complete course in auto, truck and tractor electricity and storage batteries. Greatest outlet of auto electrical and battery equipment.
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Name _____

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Don't delay a minute—and that coupon in right now for our big free catalog and full particulars of this wonderful offer.

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Free Proof That Cooke Trained Men DO EARN **\$3,500 to \$10,000 A Year**

Let me send you Free, this big package of "Vital Facts" showing what "Cooke Trained Men" earn, the big opportunities Electricity offers and how you, too, can earn \$3,500 to \$10,000 a year. The coupon will bring it Free.

Electrical Experts—Trained Men are in big demand at the highest salaries ever known. The opportunities for advancement and a big success are unlimited—positively unlimited. The Electrical Industry faces a big shortage of trained men. It needs you and will pay you well.

What's Your Future?

It's a shame for you to earn less than \$100.00 a week. You ought to earn more. You can do it too, when you are backed up with my training—the training that makes "Big Pay Men." Don't be content with an ordinary job paying anywhere from \$3 to \$10.00 a day, with no future to speak of. Strike right out—hold the job you've got and prepare for a better one—prepare for a "he man's job" in the \$3500 to \$10,000 a year class in the greatest profession in the world. I will show you the way.

Radio Course FREE

My new \$45.00 Radio Course, just completed given **Free** when you enroll for the Electrical Course. Two courses for the price of one. Two professions open to you.

Be an Electrical Expert and Get This Big Pay Yourself

Today even the ordinary electrician, the screw driver kind, is making money—big money. But it's the trained man—the man who knows the whys and wherefores of Electricity—the Electrical Expert—who is picked out to boss the ordinary electricians—to boss the big jobs—the jobs that pay \$70.00 to \$200.00 a week. Fit yourself for one of these big jobs—*Begin Now*.

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You don't have to be a College Man; you don't have to be a High School graduate. My Course in Electricity is the most simple, thorough, and successful in existence, and offers every man, regardless of age, education, or previous experience, the chance to become, in a very short time, an "Electrical Expert," able to make from \$70 to \$200 a week.

I Give You A Real Training

As Chief Engineer of the Chicago Engineering Works I know exactly the kind of training a man needs to get the best positions at the highest salaries. Hundreds of my students are now earning \$3,500 to \$10,000 a year. Many are now successful ELECTRICAL ENGINEERS.

Your Satisfaction Guaranteed.

So sure am I that you can learn Electricity—so sure am I that after studying with me, you too, can get into the "big money" class in Electrical work, that I will guarantee under bond to return every single penny paid me in tuition if, when you have finished my course you are not satisfied it was the best investment you ever made.

FREE—Electrical Working Outfit—FREE

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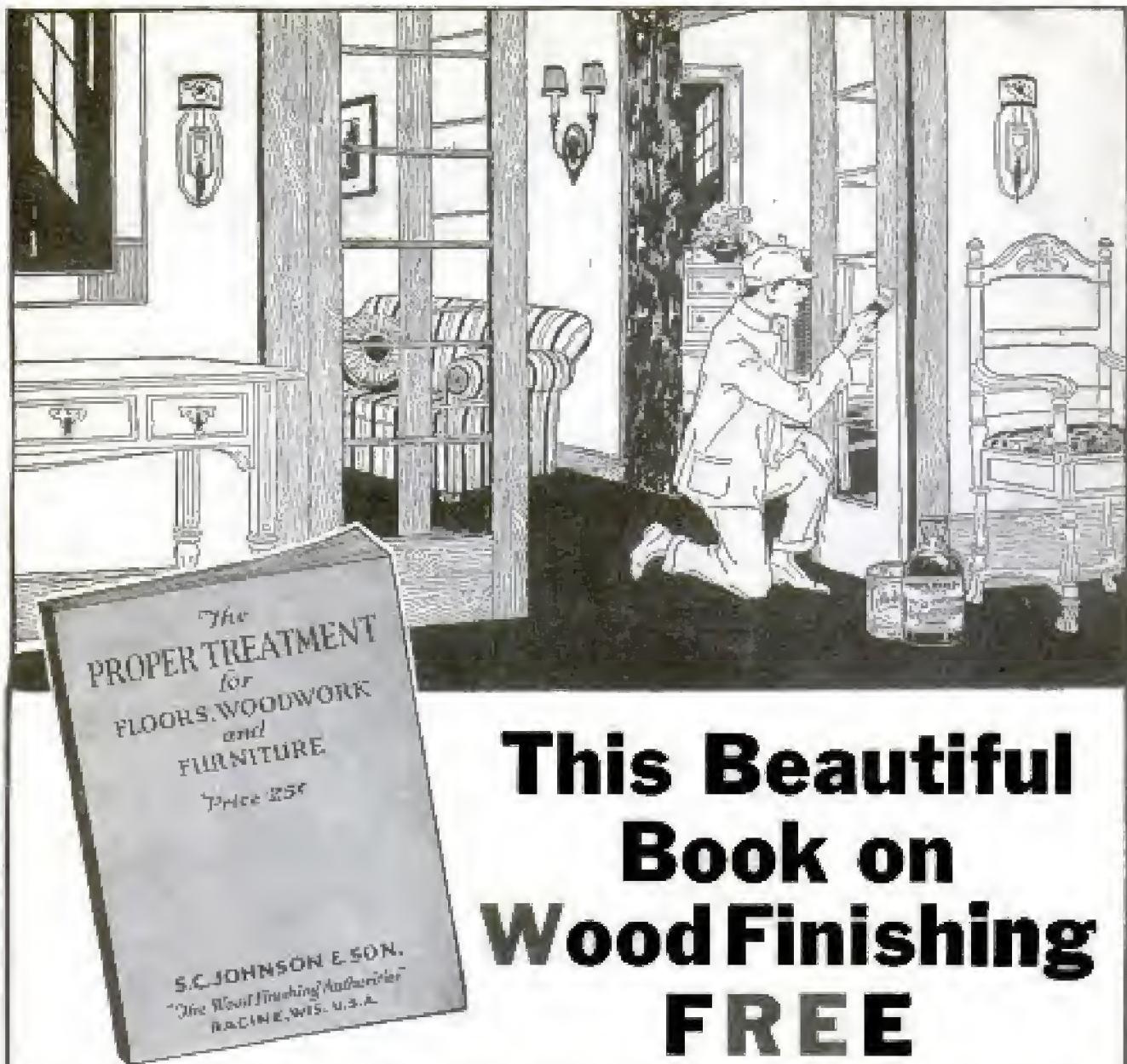
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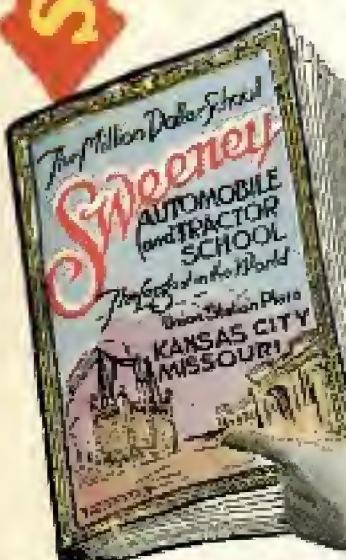
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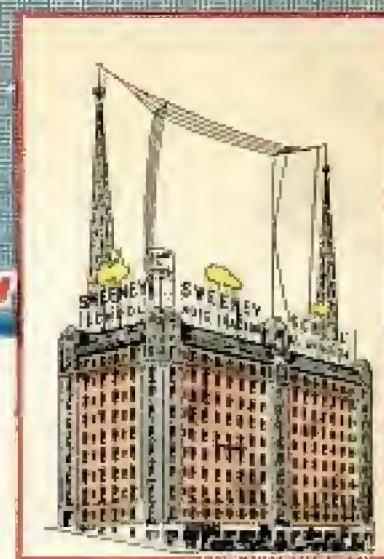
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